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FARMERS DIGEST

MAY 2 - 194

MAY, 1940

Volume 4
Number 1

U. S. Department of Agriculture
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The Farmer's Digest

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The Farmers Digest

Published Monthly at Ambler, Pennsylvania

25c a Copy *1 Year $2.00*

2 Years $3.50 *3 Years $5.00*

Foreign and Canadian Subscriptions $2.50 a Year

Entered as second-class matter at the Post Office at Ambler, Pa., May 5, 1937, under act of March 3, 1879

The Farmer's Digest

Volume 4 May, 1940 Number 1

The New Silages

507136

Condensed from Successful Farming

Frank Hamlin
Cameron Hervey

WHAT crops to use. Any crop that can be made into hay can be made into good grass silage. The crops most often used are as follows: Legumes: alfalfa, soybeans, red clover, sweet clover, alsike, Ladino clover, cowpeas, vetch, pea vines, lespedeza. Grasses: timothy, prairie, orchard, pasture, quack, Sudan, millet, dallis, bluegrass, red top, Bermuda, Johnson. Cereals: oats, wheat, rye, barley. Any desired mixture of legumes, grasses, or cereals may be used. The best crop to use is the one that produces the most feed for the least money under your conditions.

When to cut. Grass silage can be made from any hay crop cut at any stage of maturity at any time of day and in any weather. For greatest feeding value, start cutting legumes and grasses as early in the season as possible without injuring your stand. Cereals may be cut as soon as headed or when the grain is in the milk stage—but not later. Regardless of weather, start cutting as early in the morning as you like.

How much to cut. In good haying weather, cut down only as much as you can put away in the same half-day. Crops that are mature to overripe should go into the silo as soon after mowing as possible. If they are damp with dew or rain, so much the better. Allow immature or extra-wet crops to wilt a few hours before loading—especially in poor haying weather. Don't wilt too much. It is better to have your silage too wet than too dry. Dry silage packs poorly, heats, molds, and spoils. Overly wet silage leads to silo leakage which carries away valuable feed and makes an unsightly, bad-smelling mess. The best grass silage is no more and no less moist than good corn silage. Your best guide to this is the feel of the crop in the silo.

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Windrowing. A properly designed windrower attachment on the mower keeps stones out of the hay and eliminates a separate raking operation except where windrows have to be rolled up a sharp slope. In such cases, raking or swath-loading is necessary. To avoid picking up stones when a side-delivery rake is used, give the reel as much ground clearance as clean raking permits. Stones will dull ensilage-cutter knives rapidly, but seldom cause breakage unless they are of unusual size or hardness. If a tractor mower is used, the rake may be trailed behind the mower to save a separate raking operation.

Loading Equipment. Modern loaders of the cylinder-rake-bar type will pick up most crops directly from the swath. Well-built cylinder-rope loaders in good condition will handle one-swath windrows fairly well, if the crop is not too heavy. In buying a new loader, be sure to get one that is designed for handling both green and dry hay.

Building the load. Because green crops weigh about three times as much as cured hay, fair-sized loads can be put on with little or none of the labor required in building a load of dry hay. By coupling the loader close to a wind rack with sides, over a ton of green hay can be dumped on with no one working on the load. In wagon-loading, the driver may have to stop occasionally to pull the peak of the pile forward on the rack. In truck-loading, the driver can usually throw the peak forward by making a quick stop. Except for extra long hauls, it usually does not pay to build larger loads because they pitch off harder.

Unloading. Time and labor can often be saved by dumping loads at the silo. Dump bodies can be inexpensively built for trucks, and slings or other devices may be used to slide loads from wagons or trucks. With the wheels of the silo-filler set in the ground to the axles, the work of feeding the machine is lightened. Pitching with both feet on solid ground is easier than when standing on the load, and any stones that have been picked up are more likely to be seen. With this arrangement, two men can put a ton load thru the silo-filler in less than 10 minutes.

Silo-filling equipment. Almost any fly-wheel-type cutter in reasonably good condition will cut and elevate green hay crops. Some increase in normal operating speed may be necessary. If you have trouble with the blower pipe clogging, make sure that pipe is strictly vertical, that knives are sharp and set as close as possible to the shearplate, that no holes are worn in the blower

or pipe, and that the fans run close to the bottom of the blower casing.

Machines with throats 14 inches wide or wider are easier to feed, work faster and at less power cost per ton cut than smaller machines. Modern machines with feed rolls designed for handling hay crops are easier to feed than standard ensilage-cutters. The silo-filler should be set for a fourth- to a half-inch cut. Silage cut on longer settings does not pack well. Shorter settings slow up the work and needlessly increase power costs.

Why a preservative should be used. Green hay by itself, especially when made from immature crops which are low in sugar and high in protein, often makes bad-smelling, low-grade silage. The addition of a little molasses furnishes enough sugar to make lactic and acetic acids which prevent undesirable fermentation and preserve green hay crops, in exactly the same way that the sugar already present in corn preserves corn silage. The same result can be secured by adding a small quantity of phosphoric acid, which prevents undesirable fermentation in much the same way.

Which preservative to use. Molasses and food-grade phosphoric acid make equally good grass silage. In some sections, it costs less to use molasses. Either cane (blackstrap) or beet molasses may be used. It should weigh between 11 and 12 pounds per gallon. If it weighs less, it has probably been diluted. In other sections, the over-all cost may be less with phosphoric acid. The acid is slightly easier to apply at the silo-filler, and there are fewer gallons of it to handle. Altho phosphoric acid is only mildly corrosive, it is necessary to rinse off the silo-filling equipment after each use.

Very little of the feeding value of the molasses used to preserve grass silage is lost during the process. The use of more molasses than is needed to preserve the silage simply adds to its feeding value. Phosphoric acid also pays its own way to a considerable extent by correcting any lack of phosphorus in the ration and by adding phosphorus to the soil very easily via the manure route.

In other words, the choice of preservatives depends on availability, price, and whether you want to add feeding value to your silage or whether you want to add phosphorus to your rations and fertilizing value to your manure.

How much preservative to use. Plan to put on the preservative in accordance with the following table—it is not necessary to be exact or to weigh your loads. If

you get on a little more or a little less than the recommended amount, you will still have good silage. Recommendations are given for undiluted molasses and the two most generally available concentrations of food-grade phosphoric acid. Other concentrations should be used in proportion:

Kind of Crop	Amount of Preservative Per Ton of Silage		
	Molasses	68 Percent Phosphoric Acid	75 Percent Phosphoric Acid
Immature cereals	40 lbs. or 3.5 gals.	9 lbs. or 2.8 qts.	8 lbs. or 2.4 qts.
Mature grasses	40 lbs. or 3.5 gals.	9 lbs. or 2.8 qts.	8 lbs. or 2.4 qts.
Immature grasses	50 lbs. or 4.3 gals.	12 lbs. or 3.7 qts.	10 lbs. or 3 qts.
Legumes mixed with grasses or cereals ...	60 lbs. or 5 gals.	14 lbs. or 4.4 qts.	12 lbs. or 3.6 qts.
Mature legumes	70 lbs. or 6 gals.	16 lbs. or 5 qts.	14 lbs. or 4.2 qts.
Immature legumes	80 lbs. or 7 gals.	18 lbs. or 5.6 qts.	16 lbs. or 4.8 qts.

How to apply the preservative. The simplest method calls for a drum or keg, two valves, and a short hose or pipe leading to the blower. For phosphoric acid, a wooden keg and rubber hose line should be used. For molasses, the line should be one inch or larger in size. Enough preservative to treat each load is poured or allowed to run by gravity into the drum or keg. A pail or two of water may be added, if molasses does not flow fast enough in cool weather. Phosphoric acid should be diluted with three or more times its volume of water to insure good distribution. One valve is used to open the line *after* cutting starts. It should always be closed *before* cutting stops. The other valve is used to regulate the flow so that the last of the preservative will go into the silo-filler with the last of the load.

If preservative runs into the blower when no feed is being cut, pipe clogging results. Attachments are now available for most silo-fillers which automatically shut off the preservative when no material is being cut and also control the rate of flow in proportion to the amount of material going thru the filler. For large operations, pumps are sometimes used to save lifting and pouring molasses, but they cost more than gravity systems, allow greater chance for error in applying the right amount of molasses, and are of no use for handling phosphoric acid.

Filling the silo. Any well-built, properly filled, permanent silo will preserve grass silage with no more spoilage than is usual with corn silage. Temporary silos, made of snowfence lined with reenforced, moisture-proof paper,

are being used with some success but cannot be expected to carry silage over long periods or during warm weather without considerable spoilage.

There is no need to finish filling the same day you begin. Surface spoilage will usually not start for two or more days. Grass silage may be stored in the same silo with corn or sorghum silage, either above or below. When the silo-filler is set for a one-fourth- or a half-inch cut, only one man is needed with the distributor pipe in the silo. Tramp the silage thoroly, especially along the wall and the top third of each filling. Put in at least 10 to 15 feet of silage. Smaller lots don't pack well.

When feeding is not to begin immediately, surface spoilage can be checked by sealing the silo with a foot or more of wet weeds, straw, sawdust, or other waste material. A layer of tarpaper between the silage and the sealing material will often reduce losses to practically nothing. Many operators are able to hold surface spoilage to a few inches without special sealing, by leveling and tramping the top thoroly and then wetting down the surface several times during the week following filling.

GRASS silage is being used successfully in the rations of dairy and beef cattle, horses, sheep, swine, and even poultry.

Phosphoric-acid grass silage, when made with enough acid to bring the acidity close to that of finished corn silage, will be readily eaten by livestock. At the Ohio Experiment Station, molasses silage was considered fairly palatable, for dry cows on pasture ate an average of 36½ pounds daily.

Poor-quality, unpalatable silage is frequently due to ensiling material too high in water content or to having poor drainage in the silo. In either case, abnormal fermentation takes place, resulting in a bad-smelling silage which is not relished by the livestock. Also, too low a moisture content may result in silage which has been partially burned.

There is a great amount of variation among animals with reference to their liking for grass silage, some dairy cows eating as much as 100 pounds a day and others refusing it entirely; but, in general, it will be eaten readily, and with little waste.

Grass silage as a summer feed. On many farms, grass silage offers a good means for supplementing burned out pastures during the hot, dry months of summer. An early-season hay crop can be stored in an empty silo

and fed as grass silage at lower cost than growing and handling soiling crops for pasture supplements.

Grass silage compares favorably with good pasture as a feed for livestock. Yearling heifers at the New Jersey Experiment Station, for example, gained almost as much on 40 pounds of timothy silage per day as they did on good pasture.

Grass silage compared with hay. Due to late cutting, leaf shattering, and weathering, the loss of dry matter in field-cured hay varies from about 15 to 30 percent. The loss of actual feeding value is much greater than this, however, since the highly digestible and nutritious part of the forage is lost, leaving the coarse, stemmy portions. Good grass or legume silage, on the other hand, can be made with a loss of 10 percent of the dry matter, or less.

Silage made from non-legumes cut at the usual hay stage will contain but very little more protein on a dry basis than hay made from the same crop at the same time. But if the non-legumes are harvested during the early stage of growth and made into silage, the protein content of the silage will be much higher than that of hay. At this stage the grasses are generally high in protein and have about the same digestibility as concentrates, but are very difficult to cure for hay.

Good silage made from either grasses or legumes will contain five to ten times as much carotene (Vitamin-A-forming substance) as good hay.

In most feeding trials grass silage has compared favorably with hay. In Wisconsin tests, alfalfa silage produced more milk, of better color, than an equivalent amount of alfalfa hay. In Michigan, alfalfa silage was compared with good cock-cured alfalfa as the only roughage for dairy cows. During the 90-day feeding trial, cows on grass silage received 444 pounds less total digestible nutrients in their grain and roughage rations, but produced 310 pounds more milk than the cows on hay.

In a 168-day beef-feeding trial in Pennsylvania, 12 steers on alfalfa silage and ground ear corn returned $6.65 more profit per head than 12 similar steers on alfalfa hay on the same grain rations.

At the Ohio Experiment Station, results were somewhat less favorable. General indications were that dairy cows did equally well whether the hay crop was fed in the ordinary manner as dry hay, or in the form of silage.

In general, silage from legumes and grasses will contain consider-

ably more protein than will silage from corn or the sorghums. Alfalfa silage, for example, will carry approximately twice the amount of protein of corn silage. Good grass silage is also higher in carotene than is corn silage.

An important advantage of grass silage is that with more sod crops, tillage and harvesting cost would be reduced. The savings in plowing and cultivating expense in growing timothy for silage in place of corn at one experiment station lowered total silage cost from $7.04 to $4.62 per ton. Harvesting and silo-filling expense was lowered $9.82 per acre.

Amount of grass silage to feed. It is best to introduce livestock to grass silage gradually. It is very compact, and most animals clean it up rapidly. For these reasons it is easy to underestimate the amount that is being fed. After they have become accustomed to grass silage and if it is to be fed in place of all roughage, livestock should be fed all they will consume, according to most authorities.

A survey of feeding practices made among several hundred dairymen and feeders in 17 states indicated that they have been feeding grass silage at the following rates to various classes of livestock:

Kind of livestock	Pounds fed per day		
	least	most	average
Dairy cows	12	95	31
Young dairy stock	11	60	18
Beef cattle	20	80	42
Sheep	1	12	3
Horses and mules	9	60	28
Poultry (per 100 birds)	—	—	4

Amount of hay to feed with grass silage. Altho a number of feeders and dairymen have used grass silage to replace all the dry roughage in their rations without bad results, most of them agree that the best results are secured when some dry roughage is fed along with the grass silage.

Due to its large moisture content, a high-producing cow will not eat enough grass silage to secure the total dry matter necessary for her maintenance and maximum milk production. Grass silage also contains little or no Vitamin D. Consequently, if it is fed as the only roughage and the livestock are not exposed to sufficient sunlight, there may be a Vitamin-D deficiency.

Another point in favor of feeding some hay is that on silage alone animals are liable to become too laxative and are more likely to go off feed.

A good arbitrary rule for feeding grass silage to dairy cattle when it is fed in place of corn silage is to feed five to six pounds a hundredweight of cow. Then feed hay at the rate of one pound to eight or ten pounds of silage.

Amount of grain to feed. The grain mixture should be adjusted to the kind and amount of silage fed. For example, it has been recommended that cows receiving more than 60 pounds of legume silage per head per day may be fed a 12- to 14-percent protein grain mixture without decreasing their production. If the same quantity of early-cut grass, legume-grass, or cereal-grass silage is fed, 16-percent protein is sufficient. No reduction in the protein content of the grain mixture should be made, however, when silage made from the mature grasses or grain silage is fed.

According to J. W. Bartlett of the New Jersey Experiment Station, if legume silage of excellent quality is fed to dairy cows along with a moderate amount of hay, his experience would lead him to believe that we may reduce the grain ration at least one third.

If grass silage is fed without hay, dairy cattle will apparently not consume as much dry matter and as much total digestible nutrients as they will when they are fed a combination of dry hay of good quality plus silage. This means that a greater amount of concentrate or grain mixture must be fed to maintain good production.

Co-operative Farm Forestry Another Avenue to Better Land Use

Condensed from Soil Conservation

H. H. Bennett

Chief, Soil Conservation Service, Washington, D. C.

THE only certainty about the work being done today to encourage better land use and conserve soil resources is that no single, simple panacea exists which will do the job. Every field and every block of land, on every farm and ranch, will have to be treated according to its individual needs and used according to its individual capabilities if true, Nation-wide conservation is to be achieved.

Farm forestry is one of the several types of work in which the Soil Conservation Service is interested.

Throughout the country, the need for better husbandry of available resources is nowhere more acute or more widespread than on the 185 million acres of farm land that carry a forest cover. Comprising roughly 18 percent of our total agricultural area, woodlands are almost traditionally neglected by the farmer. Out of 138 million acres of farm woods with possible commercial value in the United States, only 30 percent, according to a Forest Service survey, is receiving anything like intelligent management. Only 1 percent is getting really first-class intensive treatment. Moreover, in far too many cases, farm forests are being definitely abused. Grazing, deliberate burning of undergrowth, and indiscriminate cutting year after year are steadily lowering the timber growth on thousands of farms—destroying its potential value for income production. Unless this tendency is checked and even reversed, we can never hope for a completely satisfactory solution of the Nation's land-use problem.

Trees have played an indispensable part in our erosion control program from the very beginning of such work. They have helped to tie down steep eroding hillsides that were no longer able to produce crops after years of continuous cultivation. They have furnished a sheltering cover for worn-out pastures that were practically devoid of forage and

Reprinted from Soil Conservation, December, 1939

streaked with rainfall gashes. They have served to choke the growth of large gullies, to stabilize unsteady streambanks, and to screen off cultivated fields from soil-robbing winds. Altogether more than 440 million trees and shrubs have been planted in camp and project areas. This much has been done by the Soil Conservation Service alone. Other agencies of course, both State and Federal, have done more work along this line and over a longer period.

In the expanded program of the Service now going forward, trees will continue to be a most valuable tool of land-use adjustment—a potent weapon of defense against erosion, floods, and silting—and a means of increasing the productivity of certain farm lands. Over the farm lands of the Nation, there are millions of acres now in cultivation, in pasture, or idle that should have a tree cover both for their own protection and for the benefit of lands, structures, and people farther downstream. Usually it can be done with profit if woodlands are established not merely as a stop-gap but as a positive, income-producing part of the whole farm economy.

It is precisely at this point that farm forestry work has its most direct bearing on the basic land-use problem the Soil Conservation Service is helping to solve. The ultimate aim of the new program is to show that forestry on the farm is a paying proposition —to illustrate to farmers that time, money, and effort spent in the farm woods will yield a satisfactory return. Once trees are widely recognized as a crop and treated with proper care, reforestation of unproductive fields and pastures will become a desirable move from every point of view rather than—as it now so often appears—an unwarranted economic sacrifice on the part of the farmer. As land-use adjustment is made easier, its progress over the country will inevitably be accelerated.

In carrying forward the new program, a number of State and Federal agencies will work together to assist the farmer. The State extension services will bring forestry information to the farmer, and help to make the forestry projects effective. State forestry agencies will assist farmers in woodland management and in the production and distribution of planting stock for the projects. The Bureau of Agricultural Economics will take part in the development of State farm forestry programs which eventually will comprise a Nation-wide farm forestry plan. The Forest Service will co-operate in scientific investigations and have depart-

mental responsibility for all projects established in areas where most of the farm income is derived from forest products. The Soil Conservation Service will have similar responsibility for those projects located in areas where timber production is not the dominant factor in the prevailing farm economy.

Projects of this latter type will be called "farm forestry" demonstrations as distinguished from the "forest farming" projects of the Forest Service. Like the forest farming projects, however, they will be selected by a State committee, composed of representatives from each agency taking part in the program, which will be a subcommittee of the State Agricultural Advisory Council.

Once a farm forestry project has been set up, it may differ from the usual erosion control demonstration mainly in that major emphasis will be placed on sound woodland management. In each of these new areas, farm forestry work will have priority over other types of activity, but at the same time farmers will be given an opportunity to obtain the assistance of the Soil Conservation Service in applying conservation measures to their cultivated fields, meadows, and pastures.

In the new projects a great deal of attention will naturally be centered on the woods. Foresters will go into woodland areas with the farmers and help them in working out long-time plans of protection and management. If woodland management is to be effective, fences will need to be erected to keep out browsing, trampling livestock. Firebreaks and trials may be needed to guard against the danger of uncontrolled flames. Deliberate burning of underbrush will need to be discouraged. Scientific thinning will be recommended. Dead or inferior trees will have to be removed, and open areas spot-planted to build up gradually a well spaced and healthy stand.

In addition to timber stand improvement work the program on each individual farm will include a careful schedule of cutting. The farmer will know in advance just which trees to harvest in any year and which ones to leave as capital growing stock. By observing well established forestry principles, he will be able to draw out annual "interest" in the form of a crop of timber and still maintain his "principal" intact. Everything possible will be done to keep young and vigorous trees coming along all the time—to preserve the woods as a reliable asset with the highest possible value.

To the individual farmer tak-

ing part in the program, farm forestry work should bring direct and tangible benefits. In addition to better protection for the soil, it should mean a more valuable supply of timber for home use or for sale. Today, with the demand for many wood products constantly expanding, with synthetic fibers assuming a growing degree of importance in our national economy the prospects of financial return for work in the woodlands are perhaps better than ever before. Of course, there are few fortunes to be made from farm forests, but there is a welcome source of supplemental income in practically all well managed ones. And in times of crop failure, a productive woodland may well provide the cash necessary to tide the family through. In any event well managed woodlands should contribute definitely toward greater stability of farm life.

The main significance of the farm forestry projects, however, will lie in their demonstrational value. By helping farmers in a few representative areas to improve their woodlands and develop better methods of management, the demonstrations should start thousands of farmers outside the projects thinking in forestry terms. Since the results of woodland management are not always readily visible, a considerable amount of emphasis will be placed on the keeping of records. Every farmer co-operating in the program will maintain a careful account of his woods—of cash expenditures and cash receipts, of labor devoted to woodland improvement and products harvested for home use. Over the years, it is expected that most of these farmers will build up an impressive case in favor of sound use of woodland on the farm.

Squab Chickens

Condensed from The Michigan Farmer

P. J. Schaible, Ruth M. Griswold, J. A. Davidson and Selma L. Bandemer

THE Michigan Experiment Station has been attempting to work out a profitable way of using cockerels. Since chickens are raised in Michigan largely for egg production, cockerels are usually grown to broiler size at a loss. This loss is charged to pullet production and increases the cost of eggs.

Since young animals utilize feed more economically than older ones, it is desirable to market cockerels as early as possible if the market price per pound of the two classes is equal. Six-week old chickens utilize feed nearly twice as efficiently as broilers and three to five times as well as fryers or roasters.

Careful studies have shown that to produce 6-week-old chickens, 32 per cent less feed, 26 per cent less floor area, and 36 per cent less volume are required than to produce an equal weight of 12-week-old chickens. On the other hand, more area must be heated for the 6-week-old chickens. The mortality of the young birds is higher than that of the broilers, but the greater investment per death in the latter more than outweighs the loss of a larger number of less expensive young chickens. When 6-8 weeks old, chickens of various breeds, such as Barred Rocks and Leghorns, are about the same in body conformation and efficiency of feed utilization.

Birds weighing 1 to 1¼ pounds are about the smallest that can be marketed successfully. They are called "squab chickens" and have appeared on the market occasionally. Attempts to sell them have not always been successful, because they are usually served split in halves, giving too small a portion, or boned, making them too expensive. Complaints that the meat does not have enough flavor have been made. These objections have been met by serving the birds whole and flavoring them well. They have been served at several banquets and were very popular. They received favorable comments at the banquet of the Poultry Science Association in Cleveland at which 500 were served. The guests liked having a miniature whole chicken, and thought they furnished the right amount of meat for a meal. The meat is more tender and juicy than that of older birds.

In preparing squab chickens, birds weighing 1 to 1¼ pounds

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are bled, scalded, plucked, and the pinfeathers removed, preferably by waxing. The shanks, feet and oil glands are cut off. After the skin has been pulled toward the base of the neck, the neck is severed close to the body. The vent is clipped off with scissors, and a transverse slit about 1½ inches long is made about 1 inch above the vent. By hooking the gizzard with the forefinger and pulling slowly the viscera (except the heart, liver, and lungs) are drawn through the upper slit. The liver is then removed and the bird washed. The wings are folded behind the back and the ends of the legs slipped through the upper slit into the lower abdomen, which forms a pocket holding them close to the body.

Plucking the squab chickens is time-consuming if a waxing outfit is not available. They may be skinned very rapidly, but this reduces the possible storage period of the birds and makes extra treatment, such as an egg and crumb coating, necessary before cooking. For example the birds are beheaded, bled, and the feet, shanks, neck and wings at the first point removed. The skin is snipped on the abdomen, pulled over the breast slowly, and stripped from the breast, upper back, and wings in one piece. The remainder of the skin is stripped off in a second piece. The abdominal wall is then slit from vent to lower end of keel, and the entrails are removed as previously described, after which the vent and tail are trimmed off. The legs are held close to the body with a skewer forced through the hip cartilage.

The squab chickens must be cooked in such a way that they are attractive and taste good. The birds may be stuffed and those that have been skinned, dipped in egg and crumbs. They are cooked in a steamer for one-half hour, after which they may be roasted in a hot oven (450°F.) for 15 minutes, fried in deep fat 6 minutes to a deep golden brown, or baked uncovered in a casserole with vegetables and gravy for 10 minutes. Roasted and en casserole squab chickens are especially suitable for banquets, since they may be prepared ahead of time in large numbers, whereas fried squab chicken is more adapted to small groups since it should be prepared as ordered. A highly seasoned stuffing is desirable since it makes the dish more substantial and improves the flavor of the meat. Sage, onions, parsley, nuts and mushrooms are good additions to a stuffing containing considerable fat and little or no liquid. Melted chicken fat may be used instead of butter in the dressing and gives it more nearly the flavor of a matured bird.

The marketing of squab chickens would require several times the number of baby chicks to produce the same quantity of chicken meat consumed at present. For example, only one baby chick marketed as a roaster is required for 6 servings of meat, whereas 6 baby chicks are needed to furnish the equivalent of squab chicken. It takes 2.7 times as many baby chicks to produce squab chickens equal to broilers. Hatcherymen, therefore, have much to gain. Because squab-chicken production requires more baby chicks, it would extend the hatching season and result in a greater utilization of hatching capacity.

The market for squab chickens is not well developed, but the favor with which birds prepared experimentally have been received indicates that it exists. Creation of a widespread demand for squab chickens rests with the individual producer who can meet all the requirements of an exacting trade and promote the favorable publicity. The sale of chickens weighing 1 to 1¼ pounds is sound economically and should give the producer good returns for excess cockerels.

Wisconsin Ration Ups Hatchability

Yield, fertility, and hatchability of eggs are much improved when hens are fed an economical breeding ration now in use at the University of Wisconsin.

The mash is made up of ground yellow corn, 20 pounds; wheat bran, 20; standard wheat middlings, 20; ground oats, 10; meat scraps, 15; dried milk, 5; ground alfalfa, 5; salt, 1; cod-liver oil, 1.

Fed in separate hoppers at all times are whole oats, oyster shell, and granite grit. The scratch feed consists of four pounds of wheat for each 100 birds in the morning, and the same amount of yellow corn in the evening.

This ration has given very good results with mature hens of the heavy breeds, which tend to become too fat on some rations. It is believed that feeding whole oats to replace some of the fattening grains such as corn and wheat may help prevent this trouble.

Under the Wisconsin system of feeding, fully 90 percent of the eggs produced by Barred Plymouth Rock hens have been fertile. Hatchability of fertile eggs has also been good. For example, 84 percent of all the eggs set hatched in one trial, and 72 percent of those from another lot of hens produced chicks.—*Niemen Hoveland, Successful Farming*

Selective Sprays for Annual Weeds in Growing Crops

Condensed from Pacific Rural Press

R. N. Raynor
Botany Division, University of California

ONE day back in 1896 a French vineyardist named Bonnet noticed that a copper sulfate spray which he was using killed mustard plants growing among the vines but did not injure oats. Starting with this chance observation of Bonnet's the practice of spraying weed-killing chemicals on fields of cereal grains and a few other crops has developed to the point where hundreds of thousands of acres are now treated each year in Europe. The method was tried experimentally in California as early as 1906, but it was not taken up commercially until 1935. An estimated 17,000 acres of grain and flax were sprayed last year, with prospects for a considerably larger acreage in the present season.

The "selective" or differential action of sprays on crops and weeds depends primarily on differences in wettability of plants. These differences are easily demonstrated by dipping plants of mustard and of barley in a pan of water. On withdrawing the plants it will be found that the mustard is covered with an even film of water, whereas only a few isolated drops stick to the barley. Since the ability of a selective spray to kill a plant is conditioned by its ability to first stick to the plant, it follows that weeds not wetted by aqueous sprays, wild oats for example, will not be killed. It also follows that some crops, beans for example, cannot be sprayed, as they are wetted and consequently killed.

Although copper sulfate was used for a time following Bonnet's discovery of the selective action of its solution, it has now been largely replaced by other chemicals having one or more advantages over it in the way of lower cost, greater ease of application, fertilizer value, or fewer failures during adverse weather conditions. Sulfuric acid, for example, is not only cheaper but kills much faster than copper sulfate, and rain falling a few hours after spraying does not appreciably affect the final result. In Europe, where the fer-

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tilizing of grain crops is more widely practiced than here, the finely ground fertilizer salts are sometimes dusted on when the weeds are young and tender and therefore easily killed. In general, dusts work more slowly than sprays, and for that reason are more likely to be washed off by rain before the weeds are completely killed. There has been some dusting with calcium cyanamid in this country, but dusts on the whole have received little attention here.

The sprays now used in California are sulfuric acid and sinox. The active ingredients in the latter are the sodium salts of the dinitro-cresols, principally dinitro-ortho-cresol. The more common annual weeds, the crops in which they may be sprayed, and the safest spray for each crop are as follows: wild mustard, common yellow mustard, black mustard, wild radish, fiddleneck or fireweed, yellow star thistle, and volunteer vetches in wheat, oats, and barley with either sinox or sulfuric acid; the same weeds in flax with sinox; knotweed, shepherd's purse, and mustards in onions with either sulfuric acid or sinox; yellow star thistle in grass pastures and on roadsides with either material; and yellow star thistle and mustard in alfalfa with sinox.

Although the foliage of wild morning-glory, hoary cress, and other creeping perennial weeds is killed by sulfuric acid and sinox sprays, this retards their growth only temporarily, for there is no permanent effect on the root system.

Spraying for the control of broad-leaved annual weeds should be done when both weeds and crop plants are small. The reasons for this are that, first, the young weeds are then most easily killed and with less material; second, the crop is least injured by the spray and by running over with the spray equipment; and third, the greatest benefit to the crop results when the weeds are killed before they have removed much moisture and minerals from the soil. The best time to spray mustard and radish is when they have three to six leaves. If spraying is done earlier than that, all of the seeds which will germinate that year may not have sprouted and so the sprayed fields may not be absolutely clean at harvest time.

The amount of chemical required to spray an acre varies with the kinds of weeds to be controlled, their size, and the conditions under which they have grown. More material is required to kill wild radish, fiddleneck, and yellow star thistle than to kill the various mustards. Both less material and less vol-

ume of solution are required to kill young weeds than to kill old ones. Not only amount of material required, but rapidity of killing also is determined by the condition of the plants as influenced by soil and atmospheric conditions. Moderate temperatures, high humidity, and ample soil moisture produce succulent plants with a thin cuticle or outer skin through which chemicals penetrate more easily and rapidly than through the thicker cuticle of plants which have grown at high temperatures, low humidity, and with deficient soil moisture.

The quantity of sinox used in spraying mustard ranges from three-quarters gallon per acre on plants with three to six leaves, to one gallon per acre on plants in the bud stage. The corresponding amounts of sulfuric acid are, roughly, 100 and 120 pounds per acre. For wild radish, yellow star thistle, and fireweed, the dosage varies between one and one and one-half gallons of sinox, and between 120 and 200 pounds of sulfuric acid.

The number of gallons of water in which the above amounts of material are dissolved is not especially important, provided the volume is enough to insure proper coverage with the particular type of equipment used. As little as 15 gallons of diluted spray per acre is sufficient in airplane spraying of sinox, where a fog-like mist is produced, but as much as 150 gallons per acre may be necessary where large weeds are sprayed with ground sprayers at low pressures.

Spraying costs, including both material and application, vary between $2.00 and $4.50 per acre. The exact cost depends on the material used, the kind and condition of the weed, and the kind of spraying equipment. Whether spraying is economically justifiable must be determined for each individual case. It is obviously not justified where the weed infestations are light and can be hand-pulled at less cost. Where, on the other hand, weeds are so thick that the cost of hand-pulling is prohibitive, and where the value of the increased yield resulting from elimination of the weeds is more than enough to balance the cost of spraying, it is a profitable practice.

In the long run growers should place their chief reliance on crop rotations, the use of clean seed, and shallow cultivation of the seed bed before planting as weed control methods; but where, for some reason, these are not practicable or successful, spraying offers immediate, although perhaps temporary, relief.

A Report on Artificial Breeding

Condensed from Holstein-Friesian World

J. W. Barlett and E. J. Perry

New Jersey Agricultural Experiment Station

ON May 16, 1938, ninety dairy farmers in New Jersey owning some 1,000 Holstein cows, employed a full-time veterinarian to breed their animals under an organized co-operative program of artificial insemination. Three sires, two of them proven and one a senior yearling, were leased from the New Jersey Experiment Station and stabled on the farm of a co-operator. Since the beginning of this project, the number of organized units in this state has increased to five, with six veterinarians employed to inseminate approximately 6,000 cows.

During the eighteen months or since the first unit began active operations, many practical lessons have been learned. A number of problems requiring scientific study remain to be solved. It is recognized that an enthusiastic farmer leadership plus the possibility of using an outstanding proven sire, facilitated the organization of the first unit. This original unit has now expanded to 250 members, enrolling 3,000 cows, with two veterinarians employed. Two-thirds of the cows are Holsteins and the others are Guernseys.

The first group of facts learned from this practical experience may be called physiological and pathological, while the second group pertains to matters of organization and management.

For the sake of brevity, the data accumulated will be reported here in formal statements.

1. Variation in insemination rate per pregnancy is not confined to mature bulls. Some young bulls are not only low in rate per pregnancy, but vary greatly in amount of semen per ejaculate.

2. Variation in insemination rate per pregnancy exists among bulls whose semen appears to have equal density and whose sperm have equal motility.

3. Variation exists among bulls in the duration of motility of sperm stored under identical conditions.

4. The fertilizing ability of sperm of bulls varies after storage even though motility appears equal.

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5. Bulls ejaculated infrequently often give semen devoid of sperm in the first and sometimes in the second ejaculate.

6. At least three bulls of a breed are needed in every co-operative unit. It appears that four may be necessary as old bulls become temporarily sterile without any warning. The resting of bulls for short periods appears to be advantageous.

7. Young bulls generally have a higher rate of conception per number of services. It appears that they settle first calf heifers at a higher rate than mature bulls.

8. There is apparently some deterioration of spermatozoa from time of ejaculation until they reach the farms of co-operators.

9. Insemination during full and late oestrum show the highest rate of conception. Full oestrum is one that has progressed 8 to 12 hours and late oestrum is 12 to 24 hours.

10. Regular systematic exercising of bulls yielded as much as 51 per cent increase in semen. In August, daily semen samples were taken alternately from three bulls in Association No. 1. The total was 147 cc. for the month. Beginning September 1, they were put on an electric exerciser daily for an hour and walked at the rate of 2¼ miles per hour. The total amount of semen for the same number of bulls was 223 cc. We believe exercise was the major factor in this increase as the management program was the same in other respects.

11. The conception rate among virgin heifers is less than among cows that have calved one or more times.

12. Seventy-five per cent of cows not becoming pregnant on first or second inseminations were not born in the herd.

13. Forty per cent of all cows inseminated have shown some inflammation of the uterus, cervix or vagina.

14. Poor rates of conception in some herds that are apparently in normal health is unexplainable. Some bulls appear to be incompatible with certain cows.

15. Average rate of conceptions of cows becoming pregnant among 1,950 cases, is 1.67. Average rate of conceptions of all inseminations is 2.0. The per cent pregnant on first insemination is 54.8 per cent.

The lowest rate of conception per pregnancy for one bull is 1.96 on 406 cows pregnant. The highest rate is 1.47 on 616 cows. Both bulls were past seven years of age.

Organization, Management and Application

1. From the theoretical viewpoint, only proven sires should

be used, and even then some disappointments are sure to occur. A linebreeding program should be adopted and a new group of bulls will have to be secured every two and a half years to avoid inbreeding. Farmers cannot choose the particular sire they shall use each day, thus eventually sires will be bred to their own daughters unless new bulls are used.

2. Associations should agree to prove young bulls by breeding two or three a year to at least 50 cows. This is one of the greatest problems of the program, and unless carefully watched, will sound the death-knell of an association. In this connection, a middle ground must be sought. Too great a use of mature bulls may cause such a low conception rate as to discourage the membership. Too great a use of young bulls is unsafe from the genetic point of view.

3. The bulls should be centrally located. Care and management supervision should be under the direction of a managing committee or directors, whose word will be law. The bulls must have the best care possible to give a breeding animal.

4. The conception rate must be high. Only 50 per cent of the dairymen appreciate the value of blood lines, whereas the other 50 per cent expect all cows to conceive on first service.

5. All insemination service must be on a cash basis. Credit breeds dissatisfaction.

6. The sale of young bulls will decrease but the sale of females will increase with an opportunity to breed to proven bulls. The present demand for milk requires two breeds on many farms.

7. The co-operative unit is not applicable among the large or professional breeders as the choice of bulls each day is impossible.

8. Large units are more easily managed than several small ones. Veterinarians find it advantageous to be centrally located to a certain district, but they secure a daily semen supply from a central bull unit. New Jersey has three central bull barns and five organized units.

9. Co-operative artificial breeding of live stock is the greatest factor for animal improvement today. With sound leadership and a well-planned program of blood lines it will succeed. Much need still exists for both scientific and practical knowledge in animal breeding.

Dangerous Grass

Condensed from Capper's Farmer

W. A. Albrecht

University of Missouri

SICK soils will not produce healthy plants. Sick plants will not nourish healthy animals. Sick animals will yield no income. What shall it profit us then, if our frantic search for a foolproof grass to grow on abused soil is successful?

Nationally we have become conservation conscious within recent years. We have come to recognize the threat to civilization from soil erosion. We have embraced the obvious solution, protective covering to heal the scars of wind and water, to hold the remaining surface and fertility.

But suppose we do succeed in getting the sick land back to grass? Suppose we find plants that will exist on it? They will hold the surface, which is desirable, but will they restore the land to useful production? Vegetation that will not support healthy animal life will not solve our problem.

Granting that a sod can be established, what kind will it be —sick or healthy? The query is not concerned with varieties, but with the nutritive content of herbage. Increasing cases of animal malnutrition, animal irregularities, animal diseases have been traced to feeds from the less fertile soils.

Cows sustained on the production of these soils may show symptoms suggesting milk fever in the late winter, even before calving, or before giving milk, and death may occur under similar symptoms much later in the year from an ailment called "grass tetany." Irregularities develop during summer in the gait, particularly of the hind legs, suggesting an attempt by the animal to walk on its toes. A slight rise in the middle of the back and other skeletal deformities may be noticed. Occurrence of these ailments is closely associated with those soil types that are commonly irregular in crop production and which have been leached and exhausted of their basic nutrient elements.

Chemical studies have been made of soil and of the vegetation it produced which ailing animals consumed. When chem-

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ical findings are related to animal case histories, they designate the seat of the trouble as the low level in the soil of the nutrients essential for plants and required in larger amounts by animals. On the more "sour" soils where lime has been badly needed, but was not applied, and where nutrients other than calcium run closely parallel with it in deficiency degree, the pasture herbage has scarcely the equivalent of wheat straw in its content of calcium or lime and phosphorus.

Analyses of herbage which had defaulted in its support of a cow, showed a calcium content of but .27 per cent and a phosphorus composition of only .08 per cent. Ordinary wheat straw has .21 per cent of the former and .12 per cent of the latter.

The deficiency in either calcium or in phosphorus might be considered serious, according to these figures. In a certain section of Minnesota, according to the late Prof. C. H. Eckles and his colleagues, the cows showed what has been known as "phosphorus deficiencies" when the phosphorus content of alfalfa fed them dropped to .21 per cent, and that of timothy hay to .11 per cent, and that of prairie hay to .10 per cent. The hay samples submitted by the county agent in Missouri would not prohibit this phosphorus irregularity, if we can believe the Minnesota figures to fit the case located farther south.

The calcium contents of the Minnesota hays provoking the deficiency disease were 1.81 per cent for alfalfa, .39 for timothy, and .44 for prairie hay. The Missouri grass, even tho it had a sprinkling of lespedeza plants, was lower in calcium than was either the prairie or timothy hay in Minnesota, when one recalls the preceding calcium figure of .27 per cent.

Feeding cattle herbage of such composition might well be classed as a case of gross deception. Giving them green pasturage but on a soil failing to stock it to the equivalent of even wheat straw in terms of the most dominant ash constituents needed by the cow, is like bringing on the spring season but feeding a winter ration.

The animal's response to the "milk fever" treatment of calcium gluconate injected into the blood stream gives major emphasis to the calcium deficiency. It shows that the soil has not been giving the animal enough calcium, or lime, in her feed to maintain body activities. Under such soil and feed conditions she has been compelled to give up lime, and possibly phosphorus from her own body store to the point of danger to her own life

in order to build the bones of the foetus. Backbones examined after such animals have given their lives to the cause of motherhood, against the handicap of existing on the feeds from these base-deficient—particularly calcium-deficient — soils, suggest that these bones have been partially consumed periodically and then rebuilt into deformed shapes. Some have been rebuilt into solid rather than flexible spines in meeting the calcium shortage during pregnancy and rebuilding during non-pregnant or non-nursing times.

Cattle owners of long experience report increasing deficiency cases. They come now not as late in the annual breeding cycle as that period marked by the heavy milk flow just after calving. They are common, as early as 2 months before calf delivery. They come even in young, or growing, steers. The deficiencies in lime in the soil and their effects are so serious that fatalities among fine breeding animals and their offspring are making serious inroads into the animal supply of the country, to say nothing of the farmers' income.

Supplementing the ration with mineral forms, such as limestone and bonemeal, may seem adequate remedy when calcium gluconate is so effective in snatching the "milk fever" animal out of the last stages before death. Before pinning hopes on such supplements, it is well to remember that the very man who started the bonemeal feeding idea, von Gohren, pointed out as early as 1861 that some unfavorable effects might be associated with it. Then, too, whenever soils are so seriously deficient in lime as to reflect it by deficiency diseases in the animals grazing on them, such soils may be expected to be deficient in other basic nutrients of which the shortage is not so simply detected. Crop removal and leaching are not confining their inroads on the soil's supply to that of calcium alone. These other seemingly more subtle deficiencies may still remain in the ration when the lime is supposedly supplied by the mineral supplement.

Sick soils mean sick plants. Sick plants make feed that may be expected to make sick animals. When the plant factory is running short of calcium, the lime content within the plant itself can be expected to be short. Likewise a good number of other items, such as possibly the vitamins, which are manufactured by the healthy plant, may be deficient. Fertilizing the soil is more than stuffing the plant with minerals. It is a case of balancing the plant diet for better results in the plant factory just as we try to balance

the animal ration for better output by the meat or milk factory.

Plant rations are much simpler than animal rations. At most, a dozen to 14 elements are all that can be of concern even when plants are grown in water or without soil. Fortunately, our soils have not gotten so low in fertility that we are immediately concerned with this total number. Limestone and phosphorus treatments to soil are the first requisites in the light of plant and animal needs, because calcium is about 8 times as plentiful in plant ash and 40 times so in the animal body minerals as in the soil. For phosphorus, the corresponding figures are roughly 140 and 400, according to the United States Department of Agriculture. Other nutrients are not put into the plant or animal body in such large concentrations in contrast to that in the soil and the need for them is not serious. Remedying the plant ration by lime and phosphorus additions mainly to the soil will relieve us of remedying the animal ration in many cases, and will be much more simple than tinkering with animal physiology which is infinitely complex.

A simple soil treatment, like liming, can do much for the animal's sake in terms of higher content of minerals and protein in the forage part of the ration. Limestone applied to lespedeza has demonstrated its effects in many places. In one case it increased the lime content almost one-fifth. It was instrumental in helping the plant to rustle enough phosphorus out of the soil to increase the concentration of this nutrient element by one-fifth. It enabled the plant factory to pack more than one-fourth more protein into each pound of hay, to say nothing of the yield increase per acre in all of these items.

From the cow's standpoint her factory can be more efficient when her feeds are, roughly, one-fourth more concentrated in the items she needs. Other cases —not only of lespedeza—but of alfalfa and non-legumes tell of the same effects by even so simple a soil treatment as liming and suggest the soil as an opening to a simple attack on the animal deficiency problem. Certainly from the standpoint of the farmer, cures effected by soil treatment, thru the plant, and to the animals, offer more hope than attempts to diagnose and prescribe for them after they become sick.

Mining our soils of their fertility is bringing us face to face with the simple fact that plant factories are not running as efficiently for feed production as they once did. That wasn't so very long ago. Our farm meat and milk factories are, conse-

quently, also operating on less efficient levels—all our knowledge about better nutrition notwithstanding. Hope lies not so much in diagnostic surveys in the animal factory but more in the simpler approach to treating the animals to more nearly normal nutrition by way of normal feeds grown on fertile soils.

That sick soils will not make healthy animals is particularly significant at this time. We are thinking on a national scale of combating soil erosion by allowing much of the fertility depleted soil to go back to grass. In our desperate search for varieties of plants that will exist on such soils, perhaps we have given too little thought to whether the forage so grown would be put by the cow on her list of dietary delicacies. Perhaps we may well give ear to the voices of the many animals in their unattended deficiency ailments. They are seemingly shouting, "Don't let land merely 'go to grass.' Why don't you use sound methods of grass farming thru soil-fertility restorative treatments requisite for good feed production and quicker and better soil cover?" Attention to the evidence of soil deficiencies as given by the dumb animals will react with profit both individually and nationally. Soil treatments also will serve the purposes of erosion control more effectively in the better cover developed more quickly.

Spray Found to Halt Dropping of Apples

Condensed from New Jersey Farm and Garden

GROWTH substances, such as naphthaleneacetic acid and naphthaleneacetimide, when applied in the form of a spray promise to prevent to a large degree the dropping of apples immediately before harvesting.

The discovery was discussed at Columbus, Ohio, at the annual meeting of the American Association for the Advancement of Science, by Dr. F. E. Gardner, Paul C. Marth and L. P. Batjer, of the United States Horticulture Station, Bureau of Plant Industry.

The tendency for apples to drop is, in general, a characteristic of early varieties. It is also a frequent occurrence with midseason and late varieties. As the fruit approaches the proper maturity and color for harvesting, the danger of loss from dropping increases.

The experiments were conducted on an orchard scale during the

Reprinted from New Jersey Farm and Garden, Sea Isle City, N. J.

past summer and fall. Power equipment was used and the trees were sprayed thoroughly, using from seven to eight gallons of spray for small trees and as much as twenty-five gallons for large trees carrying twenty or more bushels of fruit. Some individual fruits also were sprayed with hand atomizers. Some twenty-one different varieties were included in the study.

Using various strength sprays, it was found that .0005 per cent of the growth substance was sufficient. This amounts to one part of the substance to 200,000 parts of water, or about one-half teaspoonful to 100 gallons of water. Some better results were noted when one-eighth of one per cent of oil was added to the spray. No ill effects were noted when the spray was applied with the codling moth spray of lead arsenate and lime, which suggests the possibility of combining the anti-drop treatment with the regular spray program in the case of early varieties.

As examples of effectiveness of the sprays, when eight Stayman Winesap trees were sprayed with a .0005 solution the average drop eighteen days after the spray was applied amounted to 23.4 per cent. On unsprayed trees the drop came to 61.4 per cent. With York Imperial under the same conditions, the sprayed trees dropped only 14.1 per cent compared with 40.7 per cent for the unsprayed trees.

On most varieties effect of sprays persist for two or three weeks. With the McIntosh variety, however, the effect diminishes after eight or nine days. Best results were obtained with this variety when the spray was delayed until drop started. A second spray can be applied when the first runs out.

With most varieties, the best results were obtained when the spray was applied just as the drop begins. This utilizes the the greatest period of effectiveness. The effectiveness also is influenced by the thoroughness of the spray, and to some degree, by the temperature immediately following the spray. The spray takes effect more readily under warm temperatures.

There is no visible residue left on the fruit, and tests with laboratory animals prove that the spray material is not toxic even in large amounts.

The only observable effect on the fruit is the excellent color developed which is so notable that it leads one to wonder whether there may be some more direct color effect than can be explained by the fact that the fruit hangs longer on the tree.

—*P. C. M., Washington, D. C.*

Minor Elements and Miner Methods

Condensed from Better Crops with Plant Food

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A century of cropping has been sufficient to seriously deplete the fertility of many once-good soils, even where there has been little or no erosion. In recognition of this fertility depletion, loss of humus, nitrogen, and available phosphorus was given attention. Then on the older soils potassium depletion was recognized. And finally a depletion of the available supply of minor elements has come to the general attention.

Grain farming has received the blame, and probably justly, for much fertility exhaustion. Single crop farming, whether small grain, corn, cotton, or some other crop, is not conducive to a high state of fertility. Fifty crops of grain averaging 20 bushels to the acre remove in the grain and straw N-P-K equivalent to 8 tons of high grade complete fertilizer for each acre. Some lands according to owners have produced more than this amount of grain.

Not only grain but legume crops may exhaust the soil. A 4-ton yield of alfalfa is a moderate crop. On good lands alfalfa may be grown continuously for 20 years or more and then reseeded for another like period, or as long as the crop produces satisfactorily. Removal of an average of 4 tons of alfalfa hay a year for only 20 years takes off the equivalent of 2½ tons of 16 per cent superphosphate and 3½ tons of muriate of potash per acre. Of course if the crop were fed on the land or the manure returned, the fertility loss would not be as great.

Depletion of the virgin supply of such elements as sulfur, manganese, zinc, copper, and boron has sometimes been as severe, but less frequently observed than for the standard N-P-K. The 20-year production of alfalfa may remove sulfur equivalent to 2,500 pounds of land plaster an acre, or boron equivalent to 100 pounds of borax an acre. The figure for boron seems small until it is observed that some soils may not contain this amount of total boron in the plowed depth. Similar statements hold for zinc, copper, cobalt, nickel, and others of the less abundant elements.

In short, many have been following the methods of the miner,

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with this difference, the miner usually is conscious of the limitations of his available supply of ore. Mining methods depend upon as nearly complete removal as possible, in contrast to the methods of good husbandry, which should imply conservation and wise use of the soil resources. Mining methods cannot be applied successfully to the handling of soils, as many have already come to realize. With proper methods and sufficient attention to the husbandry of soil resources, in contrast to most mines which are soon exhausted, soils may be kept productive indefinitely. This principle is the essence of the story "Farmers of Forty Centuries," by F. H. King. These old soils have been kept productive for 4,000 years by meticulous care to return everything possible to the land.

There are four major causes for loss of fertility from cultivated fields, soil erosion, leaching, waste of manure, and sale of crops or animals. Erosion takes both fertility and the soil. A skin-deep layer of rich topsoil may remove as much plant food as is required to produce one crop. Erosion losses can be prevented. Leaching, which washes soluble plant nutrients through the soil and into the drainage, may take as much of some nutrients as the crops. The leaching process is responsible also for the development of soil acidity, leaving behind toxins and a condition generally unfavorable to cropping. Much of the leaching can be prevented by proper management. Careless methods in conserving and using farm manure have resulted in an enormous and largely unnecessary waste of fertility. The best farmers now have these losses largely under control. Assuming that all general practices are good, some fertility must be removed whenever any crop or animal is marketed. Sale of animals removes relatively less fertility than sale of crops. Sale of animal products such as cream, butter, and eggs removes still less fertility. A ton of butter may remove scarcely 35 cents worth of plant nutrients. Few are as favorably situated as the dairy farmer for maintaining a fertile soil.

The major means of fertility renewal are three. The growing of legumes transfers nitrogen from the air to the soil through activity of the nitrogen-fixing bacteria. Some non-symbiotic organisms function in the same way. More legumes and more encouragement for the right kind of soil micro-organisms are needed. The purchase of feeds for livestock fed on the farm is a fruitful means of improving the fertility of soils. Purchased feeds,

such as grain and mill feeds often used to balance home-grown roughage, are rich in both the major and the minor elements. The purchase of feed is a sound fertility practice for the purchaser but hard on the seller. Last but not least, the purchase of commercial fertilizers becomes necessary for the indefinite maintenance of soil fertility. Purchased feeds may only transfer fertility from one farm to another. The purchase of fertilizer brings fertility often originating in minerals buried deep in the earth. Through the efforts of the fertilizer industry, nitrate and potash beds, gypsum and phosphate deposits are drawn upon to enrich a depleted surface soil. Both more fertilizer and more intelligent use to provide proper kinds, amounts, and methods of application are needed.

A depleted soil is often low in its supply of the available form of several elements. Good yields will not follow until all of the deficiencies are corrected. Under such conditions the so-called "minor" elements, whether zinc, copper, boron, or something else, are just as "major" in importance as the standard N-P-K. Partial correction of the deficiency only throws the nutrition of the plant out of balance and exaggerates the uncorrected deficiency.

During the summer of 1936, the author and C. E. Schuster co-operatively were attempting to grow sunflowers under greenhouse conditions as indicator plants to detect soil deficiencies. Certain soils, particularly in the deeper horizons, refused to grow satisfactory plants, even when fertilized with the usual N-P-K treatment. Always at a definite stage of growth certain deficiency symptoms developed. Unaware that any soils in Oregon were deficient in boron, but impressed with the futility of attempting to grow normal plants without some additional treatment, a solution of boric acid supplementing the supposedly complete fertilization was added to the plants. To our surprise the former symptoms of malnutrition were corrected, and normal plants were produced. Boron on these soils was of major importance to plant nutrition. This discovery has been verified many times since.

Regardless of what mineral nutrients are supplied, the addition of compost or other humus materials usually improves plant nutrition. In nature soils and the virgin vegetation develop together. Fertility improves with the gradual accumulation of humus, until the highest type of vegetation and the maximum production of which the soil is capable result. The soil is the

product of its environment and the forces and processes acting upon it. Nature's vegetation represents a major soil-forming influence resulting finally in topsoils very different in properties and productive capacity from the original minerals and rocks out of which the soil was formed.

Tillage and cropping by man interfere with nature's equilibrium. The process of gradually building the supply of humus is reversed, and accelerated humus depletion follows. Plants are themselves miners of the soil, in the sense that they extract from the mass of rock and mineral debris those elements important to plant growth. Plants are capable of absorbing nutrients from very dilute solutions, thus enabling the poorest soils to support some plant growth. Due to the power of the plant to obtain nutrients under adverse conditions, the plant material may contain a higher percentage of important nutrient elements than the soil itself. Thus the average of 33 plant materials commonly returning to the soil to make humus was 0.262 per cent of sulfur. By contrast the average sulfur content of 22 American soils was 0.055 per cent, or only about a fifth as much. The average sulfur content of 43 western soils where sulfur deficiency may occur was only 0.02 per cent, or less than a twelfth as much as for the plant materials. A similar relationship holds for phosphorus, with 0.057 per cent for 22 typical soils, and 0.103 per cent as the average for 368 grasses. The legumes are higher in phosphorus, as indicated by data from the Oklahoma Station, showing an average of 0.18 per cent for 335 legumes.

In the processes of converting plant materials to humus in the soil, certain elements are still further concentrated in the organic fraction. Results from various sources indicate that a third to half the total phosphorus in the surface soil may be in organic form. Minnesota work indicates that the duff on the forest floor is nearly 75 per cent richer in sulfur on a percentage basis than the freshly fallen leaves. This enrichment undoubtedly is due to decomposition of carbohydrates or other non-sulfur-bearing organic materials. Starting with plant materials averaging perhaps less than 2 per cent nitrogen, humus is formed containing 5 to 6 per cent nitrogen. Thus growth of plants and the return of their residues to the soil to make humus serves to absorb, concentrate, and conserve important plant nutrients.

In any soil-building program, provision for humus renewal must be given a prominent place.

Active humus in the soil is essential for these processes which liberate nutrients for plant growth. Humus materials carrying both major and minor elements provide for the complete nutrition of plants. Active humus is not only richer in many important nutrients than the pieces of stone and minerals making up the major soil mass, but organic matter decomposes more readily than the rather resistant mineral matter. The inactive residue of humus in depleted soils of course becomes less and less effective in the liberation of nutrient materials. Finally the "run-down" humus-depleted soil becomes lifeless and structureless, and sometimes nearly sterile. Some such soils will scarcely more than germinate seeds.

An adequate fertilizer program must therefore adapt fertilizer usage to humus renewal practices. The soil-building legumes and sod crops must receive adequate fertilization. Farm manure must be supplemented with commercial fertilizers, making both more effective. Light application of manure to cover more acres, with moderate use of additional commercial fertilizer is a sound practice that will improve more acres more effectively. The weaknesses of manure may be strengthened with fertilizer and vice versa. In this day of hormones, auxins, and sometimes evasive but essential growth stimulants, humus and manures take on added significance. Stable manure undoubtedly contains indol-acetic acid, skatolbutyric acid, and other similar products that have been recognized as important growth stimulants. Minor elements and compounds needed by plants in scarcely detectable trace amounts have assumed major importance in the production of crops.

The worst kind of soil mining results from production and sale of cash crops, and particularly those crops with a low acre-value that do not justify a liberal fertilization. Sale of cash crops of high acre-value is usually followed by a comprehensive and effective fertilizer practice. Even under these conditions there is alalways the danger that the supply of some overlooked, but nonthe-less important element may be exhausted. The use of many kinds of fertilizer, including compost, farm manure, and plant residues for soil improvement, helps to provide for a balanced plant nutrition. Farmers of the future will be compelled to "ease up" on their soil-mining practices and to give more attention to "putting back" into the soil, not only the standard N-P-K, but also "minor" elements that have now assumed major importance.

Strawberries for the Home Garden

Condensed from American Agriculturist

Geo. L. Slate

N. Y. State Agricultural Experiment Station

IN his immortal work, "The Compleat Angler," Izaak Walton quotes a Dr. Boteler as saying of the strawberry, "Doubtless God could have made a better berry, but doubtless God never did." This remark was not made by one whose knowledge of strawberry quality was derived from the sour, tough half-ripe berries that are so common on northern markets before the home grown berries are ripe. To have this delicious, but highly perishable fruit at its best the berries should be grown by the best cultural methods in the region where they are to be consumed. In the production of this fruit is an opportunity for many small growers. There are already too many poor or medium strawberries. Fancy, high quality strawberries, even at a substantial premium, always find a ready sale.

Soil Requirements. Fancy strawberries are produced only on good soil, the preparation of which must be started a year in advance of setting the bed. A well-drained sandy loam, well-supplied with organic matter to maintain its moisture-retaining properties, is best for strawberries. Lighter and heavier soils will do if in good tilth and well-supplied with humus, which tends to improve the structure and moisture relations of these types. Soils not well-supplied with organic matter should have a heavy growth of clover or some other legume turned under the previous season, and if a hoed crop can be grown the year previous to setting the berries so much the better. Stable manure at the rate of 20 to 40 tons to the acre is unequalled as a source of organic matter for the strawberry bed.

Thorough preparation of the soil to produce a loose mellow condition is necessary for quick starting of the plants and rooting of the runners. Superphosphate at the rate of 600 pounds to the acre may be harrowed in while the field is being fitted.

When to set. Set the plants as soon as soil conditions will permit, not much later than May 1st in New York, and preferably

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earlier when possible. It has been shown that runner plants which root in June will bear 15 times as much fruit as those which do not root until September. Early planting under conditions that get the plant off to an early start probably does more to promote big yields than any other single cultural operation.

Varieties. Strawberries vary greatly in the characteristics that make a good variety, and of the many listed by nurseries only a few are worth growing. HOWARD *(Premier)* is at present the most widely grown variety in the north. Its reliability is its chief asset. CATSKILL is rapidly forging ahead in acreage and may soon be the leading variety in the northern states. It often yields more than Howard (Premier) and the berries average larger than those of any other commercial variety. Catskill is first choice for commercial plantings of any size and should be in every home garden.

FAIRFAX is notable for its exceptionally fine quality and should be in every home garden and commercial planting. It is less reliable and not as productive as Catskill. In spite of its dark color it commands a premium when its quality is known. CULVER is the best variety available for jam and preserving and a few should be included in the planting for this purpose. The berry is soft and requires careful handling.

If it is necessary to grow strawberries on land that is too wet for best results with standard varieties, ABERDEEN and PATHFINDER are suggested. Resistance to red stele, a root rot disease sometimes troublesome in wet spots, is the characteristic that makes these varieties useful in such situations.

After the strawberry plants are nicely started they may need a side dressing of 150 pounds per acre of nitrate of soda or sulphate of ammonia to stimulate runner formation. In fertile soils or where manure has been used freely this side dressing will not be needed.

Weed control. Cultivation and hoeing sufficient to keep down weeds and provide a loose soil for the runners to root should be practiced throughout the summer. Remove blossom clusters as soon as they appear, as fruit the first year will greatly reduce plant growth.

As soon as the runners appear in quantity, space them carefully around the mother plant six to nine inches distant from each other. After the row is filled with plants to a width of 18 inches, all runners which develop later should be removed and not allowed to root. Many varieties produce far more runner plants

than are needed for a full crop. These surplus runner plants produce very little fruit and compete with the others for moisture and nutrients, with the result that the size of berry and amount of crop are greatly reduced the following year. More plants than are needed to fill out the row when well-spaced are worse than weeds in a strawberry bed.

In late August and early September, the strawberry plant forms the fruit buds which will produce the crop the following year. At this time a plentiful supply of plant food is needed to stimulate fruit bud formation. An application of 250 pounds to the acre of nitrate of soda or sulphate of ammonia at this time has often given good results in terms of next year's crop. To prevent burning, apply the fertilizer when the foliage is dry.

Mulching. In the North all strawberry beds should be mulched for winter with straw, marsh hay or some similar material. Failure to mulch means a weedy bed and dirty berries difficult to sell. In open winters with little snow, an unmulched bed may be severely injured by freezing of the crown and consequent destruction of the stored food which is necessary for a vigorous plant the following spring. Unmulched plants may appear normal in the spring but collapse in hot weather under the strain of ripening a heavy crop. The old rule to apply the mulch after the ground was frozen has been modified, and it is now believed that the mulch should be applied before temperatures in the fall drop below 20° F. An early sharp freeze in which the temperature drops below 18° F. before the plants are fully ready for winter is most dangerous. In general the mulch should be applied in New York state before November 15th.

Legume Silage

Condensed from The Poultry Item

Paul W. Allen

University of Tennessee

THREE years ago in connection with some poultry experiments at the University of Illinois, we decided to try out some especially prepared legume silage as a food for hens.

It was December 1936. The weather was cold and no green material had been available for weeks. The combs of the fowls we had in our experimental poultry house did not have that healthy bright red color; their legs were not as bright yellow as of summer. Many of the birds were looking ragged from molting. Feeding time did not appeal to the poultry. It was into these drab winter conditions that we "opened up" some silage and fed it to a surprised bunch of fowls. At first they seemed doubtful; and then began eating with a zest which surprised us all. They went to work to clean it up. The poultry had cast their votes and it was unanimous! We agreed with the fowls that in bright green legume silage, especially prepared, is a high protein food containing green succulence, much lactic acid, and the enzymes and vitamins which go with "fresh green vegetables."

Early in the summer of 1937 we "put up" 5,000 pounds of legume silage. We had found that a hen would eat approximately four ounces of legume silage per day and that 5,000 pounds of legume silage would feed one hundred hens for six months. Our dream was more eggs during the winter when fresh eggs bring the most money. Throughout the winter, all the silage we made remained bright, green, succulent, and strongly lactic acid. We used silage made from red clover, alfalfa, soy beans, and Lespedeza serecea.

During the winter of 1937-1938 we were thrilled to see our poultry eat out legume silage. When we entered the poultry house the fowls were all in a commotion at the prospects of feeding time. The situation was very different from that when just mash was being fed. We came to realize that the zest of the appetite of poultry has something to do with the amount of food taken. Here are a few results which speak for themselves.

During the last half of 1937, we divided some sixty young cockerels into two groups of which one group received legume silage while the other did not.

Reprinted by permission from The Poultry Item, March, 1940, Sellersville, Pa.

Both groups received a basic ration of grain mash. The cockerels which received legume silage put on 20% more weight than those which did not.

During January and February of 1938, our experimental flock of poultry was divided into two groups, one group receiving legume silage while the other did not. Both groups received the same basic ration of grain mash. The hens which received the legume silage laid 50 to 60% more eggs than that part which did not. The eggs were of fine taste and normal appearance.

We as farmers are rapidly becoming conscious of the many advantages of legumes as green manuring crops, as erosion controlling crops, as valuable crops in crop rotations, as high protein crops for cattle feeding, etc. Here then is another valuable use of legumes—for poultry.

Soil Erosion Threatens America's Finest Vineyards

Buckley Maits

U. S. Dept. of Agriculture, Soil Conservation Service

WHEN highway department steam shovels took several days last July to scrape away vineyard topsoil which two heavy rains had deposited on a 25 mile stretch of state road along the shore of Lake Keuka in western New York, soil erosion demonstrated how it is destroying one of the world's finest grape producing areas.

Since Civil War days, the shores of the Finger Lakes, particularly those bordering Lake Keuka and Lake Seneca, have been famed as one of the few vineyard sites in this country where the grapes could equal the delicacy and flavor of those from the Champagne and Bordeaux districts in France. The high yields and superior quality of the red Catawbas, the Delawares and the purple Concords grown in the Keuka-Seneca section have resulted from a combination of the light, fertile soils and the tempering lake climate.

Since this is a combination of soils and climate that is hard to duplicate in other parts of the United States, the erosion damage brought to light so forcibly by the two heavy rains last summer is all the more serious. If erosion is not checked on the two to four mile wide belt of steeply

sloping land along the lake shores, vineyardists will have no other site where they can move and build their grape-culture system. They are in much the same position as a utility company whose carefully located power dams have filled with silt.

Erosion has been severe in the Finger Lake vineyards for several reasons. Most important of these is that nearly all of the early growers set their vineyards without regard to the contour of the land. Most of the rows were laid out straight up and down the slopes because it seemed the easiest way to set and stake the vines and because soil erosion was an unknown quantity. Laid out this way, they acted as gutters to speed rainwater downhill on its path of destruction. Another important reason was the grower's belief that it was necessary to keep the ground between the rows continuously cultivated. As a result, the thin layer of topsoil was bare and had no vegetative cover to protect it from the rains.

In the past 25 years, heavy rainstorms, like the two last July, have washed tons of topsoil from each acre, carried it down the vine rows and dumped it into the blue green waters of the lakes. In many of the steeper lake shore sections, raw gullies, rotting posts, sagging vines, and an unkempt growth of brambles, sumac and weeds tell how growers have abandoned their lands because the profit went out of grape-growing when the fertile topsoil disappeared.

As yet, only a small part of the vineyards has been completely abandoned, but a survey by the Soil Conservation Service of the United States Department of Agriculture reveals that about 60% of the hillside vineyards are seriously affected by erosion. Miniature deltas of topsoil extending out into the lakes at the bottom of large gullies give evidence of the destruction.

At the Hammondsport Experiment Station of the Soil Conservation Service on Lake Keuka, research tests have shown vineyardists that there is no necessity for surrendering their land to the forces of erosion. Simple conservation practices can extend the average life of the vineyards far beyond the usual 30 to 40 years. New vineyards can be set and staked indefinitely on the steep, sunny lake slopes if their owners follow a few simple rules designed to prevent soil washing. One of these rules is to plant all new vineyards across the slope, following the level or contour of the hill, instead of planting the rows up and downhill. Each contour row forms a ridge from several inches to a foot high that

acts as a miniature dam or terrace. These dams hold the water so that it can sink into the soil and provide moisture for the vines.

At Hammondsport, contour grape rows and up-and-downhill grape rows planted side by side have demonstrated what soil erosion does to grape yields. During the four years that the tests have been underway, the contour rows have yielded from 600 to 2500 pounds more grapes per acre than the rows up and downhill.

In spite of this, growers will probably be reluctant to tear out thousands of acres of old-style vineyards and plant them on the contour, as the new ones are planted. To provide an answer to this situation, experiments have developed conservation measures which are partially effective even when used with the up-and-downhill planting. Diversion ditches can head off water in these old vineyards if constructed properly. Certain types of cover crops, notably ladino clover, can be alternated in such a way that they will lessen soil washing and not offer too much competition for moisture. Straw mulch can also be used effectively.

However, on the steepest, most eroded slope, it is advisable to tear out grape vines with rows up-and-downhill and reset on the contour. Research men at the Hammondsport Station feel that contour-planting of the grapes will greatly increase the productive life of a vineyard. They think that the future of the Finger Lakes section depends on whether growers change to a contour vineyard system.

Effect of Age Upon Gain

Condensed from the Shorthorn World

David I. Day

DURING the years about World War times and after, beef consumers everywhere demanded smaller, lighter juicier cuts of meat. So farmers and feeders began marketing beeves at an earlier age. The old days when we sold beef cattle at four and five years old, great big fellows which really brought the scale beam up with a bang, came to a definite close, probably never to return. Families are smaller, and eating habits have changed. So now we market cattle as yearlings or younger, rarely ever sell an animal over two years old.

Most cattlemen can remember buying feeder cattle which in none too good condition weighed over 1,000 pounds. Now, there are all kinds of feeders quoted according to age—feeder calves, yearling feeders and so on. With cattle of feeder grade purchasable at so many different ages and sizes, naturally the commercial herd man and feeder of cattle is very much interested in which will return him the best profits. A lot of thinking and record-keeping has been done along this line so now we have fairly safe conclusions to pass along to interested people.

We can figure now pretty safely upon what effect age has upon the rate of gain a bunch of steers will make, upon the amount of feed required to market cattle of these various ages, upon how long the cattle of the various groups will have to be fed, and several other things.

Interviewing fourteen farmers in central and southern Indiana and in five counties in Illinois, we found quite strong convictions among them as to what the age of a bunch of cattle will have to do with the rapidity of gains made. It depends upon whether you are talking of western calves brought up on grass mostly, they agreed, or upon calves from a cornbelt farm where, comparatively speaking, the animal has been fairly well-fed from birth. In the first case, the animals will be thin, having had only a ration calculated to produce growth. In the second case, the cattle have been so fed that they have tended to grow and fatten at the same time.

Cattle by nature make their most rapid growth the first twelve months. They will slow up in growth the second year and still more the third year. Well-

Reprinted by permission from the Shorthorn World, Aurora, Ill., Feb. 25, 1940

fed stuff, like baby beef cattle or purebreds being primed for the show circuit, will gain only about three-fourths as much the second year as they do the first, despite the large frame developed by that time. In calves fed well from the first, the younger they are, as the farmers say, the faster they gain. The exact reverse is true with thin cattle. Put a number of thin beef cattle, all of the same breeding and quality, in a feedlot together and the older the animal the faster he will gain as a rule. The larger capacity of these cattle is what enables them to register faster gains than their younger and smaller companions.

A southern Illinois feeder and farmer who raises some calves, occasionally purchases westerns, and is always scouring the countryside for bargains in feeder animals told me in December that a thin calf in his lots rarely made 2 pounds gain daily. But it was comparatively easy to take a yearling that was thin but still healthy and put 2¼ to 2½ pounds daily gain on him. He believes that still better gains can be put on a two-year-old animal but his experience with beef cattle of that age has been limited.

"However, merely the rate of gain isn't all there is to consider," explained this farmer. "You have to figure on the amount of feed required to get a pound of gain. Here is where the calves make you the money. I've fed out hundreds of market cattle, three-fourths of them being Shorthorns or carrying considerable Shorthorn blood. The younger animals always make a pound of added weight on a lot less feed. The reason is simple. A young animal makes a part of his gain on increase of muscle, bone, and the organs of the body while the gains you get on an older animal are more merely fat deposits. As there is less water and more energy in fat, naturally more feed is required to form it. When you stop to think about it, you will see that a younger animal consumes more feed *in proportion to what he weighs*. As a rule, a young beef animal chews his feed better."

Many colleges have conducted tests along this line. All indicate that the calf will require less feed per pound of gain than a yearling and considerably less than a two-year-old animal. As a result of this situation, practical feeders everywhere say that you can profitably feed calves over a much longer period than you can in the case of older cattle. Young beef animals can be kept for weeks and months awaiting a favorable market and all the time, they will be making fairly profitable gains. If a farmer finds the market against him with a bunch

of mature steers, however, he is somewhat on the spot. They will gain slowly and at considerable cost. As a rule, it is the experience of most feeders that after you've full-fed them around five to six months, they had better be sold if the market is at all satisfactory because after that time the gains they make will really cost you.

Considerable variation of opinion and experience is found as to the actual time needed of heavy feeding to put cattle of different ages in choice to prime market condition. Most farmers believe six months is plenty for two-year-old animals, seven months for yearlings, eight to nine months for calves. Of course, all agree that young cattle can be fed longer than mature cattle and a great many farmers make no effort to put cattle into prime condition. They find it more profitable to give the cattle a short feed and market them before they are really finished.

Occasional arguments arise as to the increase in weight that must be put on beef cattle of different ages before a buyer would consider them prime. Possibly, there is not a great deal of difference. Most practical feeders believe a little less increase is necessary in the case of two-year-old animals over yearlings and calves, provided all are in the same condition at the start of the feeding period. Of course, it is a different proposition when gain up to prime condition is figured on the initial weight of the animals. Calves will increase possibly 85 to 90% of their initial weight while in the feedlot. Yearlings will increase 60% and two-year-olds 35 to 40%. Naturally, these percentages vary with the quality of the cattle and the condition they were in at the start of feeding.

The total amount of feed required to bring beef cattle to market will be about the same for all ages. The calves will eat less daily but the longer feeding period may equalize that. One can notice, however, that calves eat more grain and less hay in proportion, while older cattle have greater capacity and consume more roughage and less grain, relatively. Some farmers say they do not like to feed calves as they require more care, better shelter, and must be handled easier and more kindly. It requires more skill to get a calf to eat enough to grow and fatten at the same time. It takes older animals to set the record in consumption of wholly unmarketable roughage and to get along with the least care and comfort, and still make profits.

Farmers, too, who wish to have hogs follow the beef herd like

older cattle. The younger animals make a more complete use of their feed and so leave less for the hogs. An Indiana farmer kept fairly complete records last year and they indicate that hogs following a bunch of yearlings made only 40 pounds of pork per steer over a seven months feeding period, while hogs following two-year-olds made 55 pounds of pork per steer.

As a general proposition, the professional feeder likes calves, the general farmer likes more mature animals.

Handling Pigs To Be Butchered

Condensed from the Rural New-Yorker

For obtaining high quality meat, several precautions are urged for preparing pigs for farm butchering. The essential object of these precautions is to prevent an engorgement of the capillaries of the tissues with blood just before slaughtering, and to facilitate an easy drainage of blood from the carcass. Blood is inclined to spoil quickly, and an abnormal amount of blood in the tissues is apt to cause souring in meat that is put through the cure.

These are good rules for handling pigs that are to be butchered:

1. Withhold feed for 18 to 24 hours before butchering, but allow free access to water.

2. Keep the animals quiet; do not chase them or otherwise disturb them, which treatment puts them in a feverish condition at the time of butchering.

3. Guard against bruising the pigs, for in nature's attempt at healing a bruise, blood collects in the injured tissue, and large portions of a carcass may have to be cut out as unfit for use.

4. Avoid butchering sows when in heat, or therefore in a periodic season of excitement.

5. Prevent a sudden stoppage of heart action and consequent interference with free drainage of blood, as is done by shooting a pig or inserting the knife directly into the heart at the time of butchering.

Naturally a carcass is more easily cleaned and drains more satisfactorily when suspended by its rear quarters.

Following these precautions facilitates better bleeding of slaughtered pigs and better prepares them for subsequent curing of the meat.

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Ideas . . .

Condensed from American Poultry Journal

Edward A. Morrison

THERE are over six million farmers in the United States. The great majority of them keep some poultry, although flock size varies from as little as a dozen birds to as many as 400,000 (Runnymede Farm near Los Angeles). The scope of operation varies just as widely, ranging from the production of eggs for home use to the large breeding farm, hatchery or broiler plant, perhaps with a big marketing organization selling its output.

In all this variation, both in size and type of operation, there are bound to be many ideas for saving time and labor that are worth noting, and since progressive poultrymen and flock owners are continually looking for ways to increase the efficiency of their farms, we are glad to present some of these ideas that may be of value.

A good place to begin is on the cleaning operation, for it has proved to be a time-consuming and tiresome, though very important task. A device used by the Kimber Poultry Farm in Niles, Cal., to lighten this task has attracted national attention, and that is the use of the vacuum cleaner. This vacuum cleaning plant has been in use at the Kimber farm for a number of years. It has given excellent service and it makes short work of cleaning. It consists of a central vacuum blower with pipes leading to the pens. A flexible hose is attached for use in the pens, and the litter and droppings are whisked away at a speed of 80 miles per hour. It is claimed that this cleaner does an excellent job, even under the droppings pits or where the litter is packed or wet.

Still another idea that lightens the cleaning task is the use of chutes for conveying manure from the upper stories of multiple story houses to the ground level or to storage pits. In this case, a large metal scraper is used to push the litter and droppings directly into the chute through an opening in the floor or in the side wall at the level of the floor. This eliminates entirely any handling or shoveling. If desired, the droppings may be chuted directly into truckers or spreaders to be sold or spread immediately.

In connection with cleaning, it might be well to mention briefly the manure pit. While it is not primarily a labor saver, yet it is

Reprinted by permission from the American Poultry Journal, Chicago, Ill., March, 1940

an essential part of the large poultry farm if manure is to be stored on the place for any length of time. Such a pit should have a concrete floor and a roof, for its primary purpose is to prevent the leaching away of the valuable fertilizer constituents by the rain. In addition, it is desirable that the pit be screened to prevent the spread of tapeworms and other disease which flies are known to carry.

Disinfectant may be easily and quickly applied by means of a pressure sprayer. Inexpensive sprayers are available on the market; they are small and can easily be moved from pen to pen. Most modern poultrymen would be lost without one, for sanitation is one of the most important steps to poultry profits.

One of the questions that is uppermost in the minds of poultrymen is, "How can I keep my birds warm and comfortable?" Charles Kaufman, of the Iroquois Poultry Farm, Cooperstown, N. Y., answers the question to his own satisfaction with a hot air heating system. A furnace supplies the heat and a long furnace pipe conveys it to the various pens, openings being provided in each pen. A blower is used in connection with the furnace, and cold air is drawn in from the outside and from the pens, is heated and then blown into the house. The blower is used for circulating cool air through the house in the summer. Thus the unit serves three functions—heating, cooling, and ventilation.

A more common system of heating is the use of a small boiler, with hot water or steam pipes running through the house near the ceiling and returning under the floor. Where small laying houses are used, however, such plants are not so practical; in this case, a common practice among poultrymen is to use an ordinary brooder stove or other small stove to heat the house. Such heaters are generally set on tin and surrounded by a steel jacket in order to protect the house from fire.

A comparatively recent commercial product that adds to the comfort of the birds, at the same time cutting the number of hours that must be spent in the poultry house, is the automatic ventilator. A thermostat controls the size of the ventilator outlet. When the temperature begins to drop, the ventilator closes, thus aiding in keeping the house warm, while if it gets too warm, the ventilator opens in order to provide sufficient change of air and to keep the temperature down. This saves a great deal of time adjusting windows, saves worry at night, and insures as good a con-

trol over the air supply as the careful poultryman can secure by regulating the windows.

Humidifiers are also of value in the poultry house, particularly in the case of baby chicks. It is generally recognized that high humidity stimulates feather growth and makes better, healthier chicks. It also helps to lessen the danger of cannibalism by relieving dry itching skins caused by low humidity. Automatic humidifiers can be purchased ready made.

Now let's turn our attention to that all-important operation of feeding. It takes a lot of time and we all know how important it is to do a good job, yet there is no reason why we can't cut down our time. A common method is to have feed bins in each pen. This saves considerable time over the old way of going to the feed room each time a bucketful of feed was needed. If such bins can be filled from outside of the house, a good deal of unnecessary tracking back and forth is eliminated. Then too, there's the possibility of feeding and perhaps even trapnesting from the alleyway. Wouldn't that save time though! You could just wheel your barrow of feed down the alleyway, shoveling feed from it as you went.

In connection with feeding, it is the belief of the writer that the most practical plan, particularly in the long house, is the use of a carrier on an overhead track. Such a carrier can be sectioned if the free choice system of feeding is used, and each ingredient kept in a separate compartment. At any rate, a carrier of this kind will hold several hundred pounds of feed. The operator can push it the length of the house, dipping feed in a bucket and filling the hoppers as he goes.

There are many more good ideas that can be used to advantage around the poultry farm. Here are a few: folding crates for those who haul poultry to town and wish to bring back more than just a load of empty crates; fattening crates in which culls, etc., are held—the crates being all ready to load when a trip to town becomes necessary; egg coolers and combination candlers and graders for quick work in the egg room; tendon pullers for those who dress poultry on the farm; small quick-freezing units for storing perishable foods on the farm; and even sloping runs to second story floors for the man who likes to range his birds.

And here's a good rule for efficiency experts who want to concentrate a lot of birds under one roof—any poultry house over two stories high should be provided with an elevator. A few poultry farms are using the endless belt type of elevator for con-

veying feed and litter to upper stories. In this case a small 1-man elevator can be used for going up and down and for bringing eggs down to the egg room. In this connection, a small basement egg room under the poultry house will save many steps with heavy egg baskets.

Also, it's a good idea to have protection for the house against fire and for the poultry against theft. Particularly in the thickly populated areas is the latter necessary. Fire alarms, burglar alarms, and power-off alarms all have their place in the modern poultry house.

In conclusion, a little system in the daily routine, a little forethought and careful planning, and a visit to the neighbor's once in a while to get his ideas on the subject of poultry raising, will go a long way in pointing out little short cuts to poultry profits.

The Tobacco Thrips

Condensed from New England Homestead

P. J. Anderson

TOBACCO is attacked by some twenty different species of insects all of which cause more or less injury and financial loss. The tiniest of all of these "bugs" is the thrips. In spite of its insignificant size, however, its ravages probably caused more loss than any other insect the last season. The extent of the injury varies from season to season but is almost always worse in a dry year. In fact we used to say that it came *only* in dry seasons. But there was considerable injury in 1938, the wettest growing season we have seen in a generation. Still the injury of 1938 was small compared with that of 1939.

Probably its minute size—just visible to the naked eye—is the reason why it is so little known. Most growers do not recognize the insect at all and may not even suspect its presence until they see the damage in the cured leaves on the sorting bench.

To the observant grower the signs may be noted first on the bottom leaves in the field before the plants are a foot high. The midveins as well as some of the larger lateral veins take on a silvery appearance. The silver streak along the upper side of the veins is not uniform in width but, uneven in outline, running out on to the leaf web more in some places than others and often the line is broken. The whitened veinal streak is peppered with minute darker specks—the excreta of the insects. The insects themselves are not so readily seen

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as is the injury, but if the leaf is examined closely with the naked eye or a hand lens, one may see tiny very slender dark brown or black adults of the thrips crawling along beside the midribs or larger veins of the upper surface. They are only about 1/25 of an inch in length. If the infestation is very severe the lower leaves may fade out to a sickly yellow color, but usually the only symptoms observed in the field are the silvery veins.

The extent of the damage becomes apparent after the leaves are cured and arrive on the sorting bench. Then the veins which have become more blanched and white, stand out prominently in contrast with the brown color of the cured leaf. The damage is often called "white vein" by dealers and packers. There is another type of "white vein" caused by poor curing weather, which should not be confused with the "thrips" white vein. Badly infested leaves are worthless as cigar wrappers since smokers prefer not to buy a cigar with white stripes running around it like a barber pole.

The adult thrips lays her eggs in the tissues of the underside of the green leaf. These hatch in a very few days and sometimes the young insects, yellow at this stage, may be found crawling over the under surface of the leaves. They reach maturity and lay eggs for the next generation in 10 days. Thus it is possible for several generations to multiply before harvest. This explains their enormous increase during a favorable season. They do not chew the leaf but they have rasp-like mouth parts with which they lacerate the cells until the juice exudes to the surface where they are able to suck it up. After the contents of the cells are gone, they fill up with air and it is these air filled tissues that appear white and thus ruin the appearance of the leaf. The smoking quality—taste and aroma—are not affected. It is just a matter of the "looks."

All of our types of tobacco are attacked by thrips but the financial loss is greatest on the Shade type because of its use for wrappers and its higher value. Thrips veins are not so damaging on binder leaves—Havana Seed and Broad-leaf—because the smoker never sees the binder. In our experimental work at the Station, we have found that certain strains of tobacco are more resistant—or perhaps it would be better to say not so attractive—to thrips. This offers the hope that we may be able ultimately to breed a desirable type which will not be attacked by thrips. This method of control, however, is too remote and uncertain to depend

on in the immediate future. Therefore other methods of control must be employed.

Control of thrips. The problem of developing a practical method of killing thrips on tobacco has baffled the entomologists for a long time. Experiments were begun eight years ago at this station by Mr. D. S. Lacroix and for the last four years Mr. A. W. Morrill of the U. S. Bureau of Entomology has co-operated with him. A long list of insecticides applied as sprays and as dusts have been tested. The problem is complicated by the fact that it is not practical to apply a liquid spray in tobacco after it is grown. Moreover it is necessary to control flea beetles by application of rotenone dust but this same dust does not control thrips. To make two applications of insecticides, one a liquid and the other a dust, involves a complicated program which the grower is loath to undertake. Thus, although some spray combinations were found which gave reasonable control, their use was not practical. More recently, these entomologists have obtained promising results with a dust as described in the 1939 Annual Report of the Tobacco Experiment Station (Conn. Agr. Exp. Station Bul. 433, now in press). The dust which gave best control is a pyrethrum powder consistency of exhanded pyrethrum flowers impregnated with .5% of absorbed pyrethrins. This should be tested through a longer cycle of years before final recommendations can be made but experimental results of the last two years are so favorable that it could well be tried by growers who anticipate trouble with this insect. This was applied at the rate of six to eight pounds to the acre, increasing to twelve when the plants were fully developed. Twelve applications were made at semi-weekly intervals in these experiments. The same dust gave fairly good control for flea beetles but not as complete as with rotenone dust. In case of bad flea beetle infestation it might be advisable to alternate the rotenone treatments with the pyrethrum treatments.

These results are of great importance, particularly to the growers of Shade tobacco, since, for the first time, we seem to have a practical effective solution of a problem that has baffled us for many years.

The Electric Fence

Condensed from the Pennsylvania Farmer

H. F. Agnew and W. C. Place

ALTHOUGH electric fencing has been known for many years (patents were issued in this field as early as 1886), it is only within recent years that this type of fencing has become of practical importance. Like all new developments, electric fencing had to wait for several contributing inventions before the original idea could reach a point where it became practical and useful.

The most frequent questions which arise are: is electric fencing cheaper than ordinary fencing; is it effective; is it practical; and above all is it safe? A woven wire fence set on strong posts approximately one rod apart, including the necessary gates and braced corner posts, costs about $320 a mile erected; four strands of barbed wire complete with posts about $120 a mile; an electric fence, exclusive of the controller, costs about $30 a mile. These figures are necessarily somewhat approximate.

Electric fence need not be so heavy as other types because animals will not rub up against it or try to push it over. The posts may be set from 40 to 50 feet apart. The use of more posts will usually not make a better fence because of the fact that each post represents a loss of a certain amount of current by leakage across the insulator in damp weather.

One strand of wire is ordinarily sufficient to hold horses and cattle, but if animals of smaller size such as hogs are to be pastured in the same lot, two wires will be necessary. For sheep two wires are required because the wool serves as an insulation. The height of these two wires may be 15 and 24 inches from ground. As a rule the fence wire should be placed about two-thirds the height of the animal to be fenced.

It is necessary that the wire be insulated from each post. A porcelain insulator is most suitable for this purpose. Although rubber insulation is sometimes used, the practice is not recommended because leakage will be excessive in damp weather. Porcelain insulators which have a good glaze and are provided with sharp corners to break up the leakage path should be used.

No return circuit need be provided for the fence wire, because the ground acts as the return path. The "ground" should be made by driving a piece of three-quarter inch galvanized pipe

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eight feet into the ground. All that is necessary is to fasten one end of the fence wire to the controller, the other side of the controller circuit being fastened to "ground." No harm occurs if the fence wire is completed in the form of a loop around the lot.

Gates are made by providing an insulated handle and a hook on one end of the wire so that it can be hooked to an eye in the wire at the next post. If the controller is of a type which provides a "ground indicator" it is best to swing a gate from a post nearest to the controller so that if a gate accidentally is left open with the hook on the ground, the indicator will provide a warning of this condition.

Either smooth or barbed wire construction may be used with nearly all controllers. Many farmers prefer barbed wire because it penetrates thick hair, and is also easier to see.

A fence located on the other side of a highway or railroad from the controller may be connected to the controller by means of an overhead wire, or by laying a well insulated wire underground or through a culvert. However, before this is done it is necessary to have permission from the proper authorities.

Electric fencing is, on the whole, probably the most humane type of fencing that can be used. It is true that the shock is painful while it lasts, but the shock delivered by most controllers on the market lasts only a fraction of a second, and the only after-effect is a startled memory to an uninitiated animal and this shock becomes very distasteful as the experience is repeated. Animals will ordinarily test the fence only at infrequent intervals, once they have felt its sting. It is not likely that the stock will become entangled in an electric fence because the animals soon become very cautious when approaching the fence. There is also less danger of deep cuts which have at times resulted from an animal trying to break through barbed wire or even through woven wire that was not in good repair.

It is well to point out that no attempt should be made to use an electric fence for small enclosures such as small pens. The animal must have plenty of room to recoil from one wire without immediately touching another.

A bull pen should be a solid, bull-proof enclosure because an animal that may go mad and ignore pain inflicted by pitchforks and clubs is not likely to pay much attention to the pain inflicted by an electric fence. An electrified wire placed a few inches on the inside of the enclosure is a material help, since

it discourages the animal from trying to tear the pen apart. Stallions, on the other hand, are more easily controlled with electric fencing that with any other type of fence, and the same is true of most other farm animals.

The stock soon becomes accustomed to the presence of an electric fence and will clean up well around it. Horses not only feed close up to the wire, but will often reach over and eat a short distance on the other side, being careful in the meantime not to touch the wire. Cattle often get down on their knees and reach under the wire as far as possible without touching it. The result is that electric fence rows do not have the shaggy appearance that ordinary fence rows have since the ground is well cleaned up around and under the fence except, of course, for weeds which stock does not eat.

Many different fence controllers are being manufactured and about fifty or sixty companies are in the field, each company building from one to six models. However, the fence controllers can, in general, be classified in three different groups depending upon:

1. Power source used.
2. Type of mechanism.
3. Kind of shock.

In connection with the first group which is related to the power source used, there are two main divisions, namely, those controllers that work from 110-volt high line, and those that work from a local battery. There is some overlapping here because a converter can be used to adapt many of the battery operated controllers to 110-volt operation. Also converters are available for enabling a six-volt controller to work from a thirty-two-volt lighting plant.

As to the second group, the type of mechanism most generally used on battery operated controllers is a mechanical make-and-break device made up of a pendulum or balance wheel so arranged as to open and close the electrical circuit at intervals. This device is also used in many 110-volt alternating current controllers. In addition, there are also controllers on the market having relay mechanisms, motor driven contactors, thermal switches, etc., to accomplish the make-and-break of the shock current. Recently there has developed a trend toward using vacuum tubes or gas-filled tubes to give the same result without requiring mechanically moving parts or make-and-break contacts.

Kind of Shock

As to group three the kind of shock delivered by all battery controllers and by most of the 110-volt controllers is a short, sharp impulse which re-occurs

about once a second and which lasts for only a small fraction of a second. Some types of 110-volt controllers deliver an alternating current shock current which is "on" for an appreciable fraction of a second and then "off" for some longer part of a second.

Considering all the various types of controllers available the question naturally arises as to which is the one to buy. The choice depends largely on the requirements of a particular installation and on the amount of money which it seems desirable to invest. The following consideration will be found helpful in making a selection. As in everything else, quality will be found to be cheapest in the end, as a controller which is unreliable and ineffective is worse than no controller at all.

If a high line is not available, then the choice is limited to a controller by a six-volt battery or by the 32-volt farm lighting plant which may be either dry battery or a storage battery. If several different controllers are available which seem to give enough "kick" to charge adequately the amount of fence it is desirable to erect, the next problem is to judge the quality of the product in relation to its price. If the controller has a make-and-break mechanism, this device like anything that moves is subject to wear, and it is reasonable to expect that a well-built mechanism that is intended to give years of service will cost more than a cheap, poorly constructed mechanism which may fail in a short time.

When buying a 110-volt controller there are also several things to be considered. The most important is safety, and the reason for this is that the 110-volt line is an outlet for voltage high enough to kill, and it is backed up with plenty of power, as every one knows. A 110-volt controller need not be dangerous but it can be if it is not correctly and carefully engineered. Obviously, no home-made controller should be considered at all, and of those built by reputable manufacturers it is safest to select one that has been approved by some recognized authority. Wisconsin and Oregon are two states that have established minimum safety requirements for fence controllers, and no doubt many other states will follow the lead of these two states.

If the choice simmers down to several kinds of approved controllers then the type of operating mechanism or circuit which is used is probably the thing which needs careful consideration in reaching a final decision. Those selling controllers which have some mechanical contact-operating mechanism point out that a

well-built mechanism can give years of reliable service before it wears out or needs to be repaired or replaced. On the other hand, those selling controllers having no moving parts and using tubes to control the output maintain that where there are no moving parts there is nothing to get out of adjustment or to wear out and that vacuum tubes may last almost indefinitely, being inexpensive and easy to replace if they do fail. The question of choice is strictly up to the buyer who must weigh the arguments and form his own opinion as to which controller is best for his purpose.

From the standpoint of keeping an animal in the enclosure the type of shock delivered is relatively unimportant since an animal will usually be turned away by anything that shocks hard enough so that he can feel it. If the nature of the shock is such that it will also kill weeds, thus keeping the fence clean and free of leaks to ground through the weeds, this is an important additional advantage since it eliminates the necessity for frequent cutting of the weeds and increases the efficiency of the fence. It is also important to see that the controller purchased is so designed that it supplies a sufficiently high voltage to be effective not only when the ground is wet but also when the ground is dry and shocking is more difficult.

An important factor already mentioned with which many electric fences have to cope is plant growth about the fence. The stock will usually keep the pasture quite well cleaned up around an electric fence, but there are some weeds which the animals will not eat. If these weeds grow up and touch the fence wire part of the shock current goes down through these weeds, so that not enough may be left to shock the animal when it touches the fence. One or two weeds will ordinarily not matter much, but a number of weeds touching the fence may ground it so that it will be completely ineffective. For this reason, to avoid cutting weeds, some farmers in the past preferred not to use electric fencing for permanent fencing or for hog fencing in which the wire is placed close to the ground and so is affected by a greater number of low growing weeds.

Power cost will vary considerably with the type and make of controller, but will usually range roughly from a maximum of about 50 cents a month for some battery operated controllers down to a minimum of about five cents a month for a well-designed 110-volt controller.

Better Poultry Ranges

Condensed from Everybodys Poultry Magazine

Fred V. Grau
The Pennsylvania State College

POULTRYMEN are learning that pullets raised on good sod range are healthier and more capable of becoming strong layers which mean profit to the owner. Mortality on good range is lower which means reduced losses and greater net income. The minerals, vitamins and carotene content of fresh green grass are factors in flock management that cannot be overlooked.

The poultry raiser who uses the range as an integral part of his physical plant demands that the range produce an abundance of green grass throughout the season. More than that, the feed should be of high quality, palatable, and rich in minerals and food value. These features combined with a solid ground cover that keeps the poultry off the ground, and one that can stand severe punishment, should meet the requirements of almost every poultry raiser.

Ranges in use at present may be classed into four groups: (1) Alfalfa, (2) Timothy-clover, (3) Old timothy sods, and (4) Bluegrass pasture. There may be others but for the purpose of discussing the improvement of old ranges, these cover the field.

Alfalfa ranges meet the requirements of rich palatable feed throughout the season, but fail in providing a tight sod that covers the soil and stands punishment. During wet weather the open spaces between the alfalfa plants become muddy. The tall-growing plants tend to lodge and keep the soil from drying out. This attracts snails and slugs, factors in tapeworm infestations.

Red clover and timothy-clover ranges are similar to alfalfa ranges in failing to meet the requirements. Old timothy sods are better, but may fail to produce green feed during dry periods. They likewise do not furnish a tough solid ground cover.

Bluegrass sods seem to meet every requirement save one—that of supplying green feed during drought periods. By the proper combination of grasses and legumes, however, it is quite possible to obtain a sod that meets all the requirements and has none of the disadvantages.

Some of our most successful poultry raisers in the state are employing bluegrass sods on their ranges with excellent success. Others prefer to utilize their hay fields or strips, or must use them

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from lack of choice. With any type of range, it is possible to improve it through proper fertilization and management methods, and sometimes by introducing a seed mixture at the proper time.

The improvement of bluegrass dairy pastures and the preference of the farm flock for this type of range clearly indicates its value. On many farms it is possible and feasible so to arrange and manage the pasture areas that the flock is moved to a new part of the pasture each year. This alternates the use of the range so that the disease factor is reduced to a minimum. Bluegrass sods ods; sometimes by introducing a seed mixture at the proper time.

There is such a close similarity between bluegrass stock pastures and poultry ranges that we can apply the principles of the first directly to the improvement of the other. Regardless of the condition of the range, these steps taken in order should effect improvement.

Bluegrass and legumes grow best in soils that are well-supplied with lime. Feed grown on such soils will be better supplied with calcium. The soil should be tested to determine the requirement, and the full amount called for may be applied in one application at any time of the year, preferably in the fall after the

Many farmers apply lime in the spring in advance of fertilization of pastures. This is satisfactory for the poultry ranges, particularly if it is to be followed by fertilization.

The basic need for crops of all kinds, and grasslands in particular, is phosphorus. This is the basic principle of pasture and range improvement. Phosphate applied to the soil increases bacterial activity and tends to reduce disease problems. Crops grown on phosphated soils are richer in this important food element.

Old poultry ranges are generally so well covered with droppings that there will be an abundance of nitrogen and potash for the growth of bluegrass and clovers. Superphosphate applied on the surface once in two years at the rate of 500 pounds to the acre should amply meet the needs of the range. The cost is low and the benefits are great. Applications give best results when made in the fall after the birds are removed but spring applications will be satisfactory if made as soon as possible after the frost is out of the ground.

Most old ranges are sparsely covered with an unsatisfactory type of vegetation so that reseeding may be necessary in order to introduce the desired plants. This may be done and is better done without plowing.

Most ranges are situated on slopes to get the advantage of good drainage. Plowing these slopes may result in the loss of soil by erosion. Good patches of seed may be secured by loosening the surface soil with a disc or spring tooth harrow, or both. Preparing the surface after liming and fertilizing helps to incorporate the materials in the soil and to insure a catch of seed. Operations should be carried out on the contour to avoid soil losses. The earlier it can be done in the spring, the stronger will be the plants when the flock is turned out.

The choice of seeds is important since it is desired to have sod-forming plants that combine toughness with palatability. The following mixture is suggested for most Pennsylvania conditions for reseeding in the early spring so that the pullets may be ranged at the usual time:

	Pounds to the Acre
Kentucky bluegrass	5
Canada bluegrass	3
Perennial ryegrass	8
*Timothy	4
**White clover	2
Alfalfa	3
	25 lbs.

Ryegrass As a Nurse Grass

The ryegrass comes on quickly and acts as a nurse grass for the slower-starting bluegrasses. It is palatable and nutritious and stands punishment well. Under ordinary conditions it should furnish range in four to six weeks. Just enough alfalfa is included so that there will be a scattering of plants, but not enough to lodge or to become undesirable.

Seedings in the spring will develop more rapidly if made with a disc drill or alfalfa seeder. It is important to drill it in so as to place the small seeds in contact with the soil where they will germinate quickly. Broadcast seedings have a greater chance to be injured by weed growth and dry weather. It is good practice to follow the seeding with a cultipacker or roller to firm the soil around the seeds.

Suggestions are in order for those who plan to establish new ranges and who are desirous of doing a good job in order to secure results. The most important factors to consider are:

1. Preparation of seed bed.
2. Soil improvement.
3. Choice of seeds.
4. Time and method of seeding.

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*Note: Orchard grass and meadow fescue, 2 lbs. of each, may be substituted for timothy on steep, dry stony slopes.

**Note: Ladino clover, a giant type of white clover, and Kent wild white clover, a low-growing mat-forming type of white clover, may be introduced at the rate of one-half pound of each to the acre. The price of these two types is high ($1.25 to $1.50 a pound) but the results indicated in pastures should justify their use.

Preparation of the seed bed is important. It is not sufficient to prepare the ground loosely as for small grains. The soil should be plowed, then harrowed and cultipacked (or rolled) until it is quite firm—so firm that one's heel firmly planted will not penetrate more than half an inch. Working the soil several times will pulverize it so that there are no clods, which will be advantageous to the seedlings.

Soil improvement consists of lime and fertilizer, or lime, superphosphate and manure. Have soil samples tested, as previously discussed, and apply the full amount of lime after plowing, harrowing it in immediately. This should be done some time in advance of fertilizing and seeding, two weeks or more if possible.

The choice of fertilizer will depend on whether or not cow manure is available. If it is, apply ten loads to the acre and disc it in after the lime is harrowed in. Then use 500 pounds to the acre of 20 per cent superphosphate and harrow it into the soil. If no manure is available, use 500 to 600 pounds of 4-16-4 fertilizer to the acre just before seeding.

Choice of the seed mixture will depend upon the method of seeding which in turn will be influenced by farm practice. The range mixture may be (1) seeded "clear" in August or April without a nurse crop, (2) seeded with winter grain, sowing the grasses in the fall with the wheat or barley and the legumes in the early spring, or (3) seeded with spring grains.

With option 1, and seeding in August, the range will be well established by spring and will be ready for full uninterrupted use that season. Seeding in April will result in a weedier range and one less able to stand the punishment of poultry that season.

When seeding the grasses with winter grain, the rate of sowing the grain should be reduced to one bushel to the acre instead of the customary 1½ to two bushels or more. This gives the grasses a better chance and will result in a more successful legume seeding in the spring.

No perennial ryegrass should be used with winter grain since under these conditions it has a tendency to smother the other grasses. It should be included with the legumes in the early spring, which may be sown in February or March. It will be advantageous to the young grasses if the winter grain is pastured off or cut early for hay.

Seeding with spring grains requires that the work be done very early and that the rate of sowing the grain be reduced to one bushel to the acre. The grain may

be pastured off or cut for hay in the dough stage. If it is not needed for hay or pasture it may be clipped and allowed to lie on the ground to act as a mulch.

Use of Sod Strips for Ranges

Many farmers in Pennsylvania are laying out their entire farms in strips on the contour to avoid serious soil losses from erosion. In this system the strips of sod alternate with strips of corn and grain. The sod strips furnish nearly ideal poultry range conditions since the adjoining corn provides light shade and the slope which made strip farming necessary provides the desired drainage. If one does not want the birds ranging through the wheat and oats, it may be necessary to run a temporary light fence along the grain until after it is cut.

The addition of some of the sod-forming grasses and legumes to the regular hay mixture would vastly improve the cover for range conditions and would not reduce its value for hay purposes for the time that it remains in the regular rotation. This system has the advantage that the range is changed to a new location every two to three years by rotation of crops, thus minimizing disease problems.

New Practices To Regulate Fruit Crop

Condensed from American Fruit Grower

A. E. Murneek

Missouri Agricultural Experiment Station

SOME relatively recent practices have received considerable attention and under certain circumstances may be used successfully and profitably to regulate the apple and possibly other fruits crops. These are: (1) Branch ringing to increase set, size and earliness of maturity of fruit; (2) spraying with plant growth substances to reduce preharvest drops of apples; and (3) spraying to prevent fruit set in the "on" year of biennially bearing varieties. It should be emphasized at the outset that these are not substitutes for any of our present major orchard practices but only supplementary to them.

Fruit Production as Affected by Branch Ringing

We are all familiar with the fact that quite frequently apple and other fruit trees blossom abundantly but set fruit sparsely. This is not always due to faulty

Reprinted by permission from the American Fruit Grower, March, 1940

pruning, poor pollination, inefficient spraying or lack of nitrogen in the spring.

While studying the fruit setting behavior of the Minkler and Black Twig varieties, the writer found in 1937 that the production of fruit of these two apples can be increased strikingly, in some cases severalfold, by ringing of large scaffold limbs when the trees are in bloom. Curiosity being aroused, this investigation has been extended during the past two years to include other varieties of apples and several other kinds of fruit.

Branch ringing, of course, is an ancient practice. It has been used perhaps for 2000 years in the Mediterranean region and lately in California to improve the set and size of grapes, chiefly of the seedless types. Ringing of tree fruits, with this object in view, has been practiced to some extent in Great Britain and girdling in Germany, but these treatments are not in vogue in our country.

Large scaffold limbs are most convenient to ring. Our practice has been to select two to several pairs per tree, ring half of them, leaving the others as checks. Ringing is done by making with a sharp knife two parallel cuts about one-fourth-inch apart completely around the limb and removing the strip of bark. The wound is covered immediately with grafting wax. In our experience no harm to the tree has resulted from this treatment, the visible effect being mainly on the fruit crop.

The results have been beneficial to the yield in almost every instance where branches of apple trees have been ringed. The fruit set of apples, for example, has been increased as follows: King David 31.6 per cent, Rome 94.0 per cent, Black Twig (Arkansas) 204.1 per cent, Stayman 258.8 per cent and Delicious 278.0 per cent. In general, therefore, it can be said with a fair amount of certainty that shy bearing varieties seem to respond most strikingly to branch ringing.

The yield of pears was also influenced favorably by branch ringing, but not as markedly as with the apples. A 29.5 per cent increase in fruit set was obtained with the Royal Duke cherry, but the Montmorency variety, which is a normally heavy bearer, did not respond to this treatment. For some unknown reason the yield of peaches was not augmented to any extent by ringing. It is possible that in another part of the country, where peaches bear more regularly than in central Missouri, the response may be different. Our trees, because of recurrent winterkilling of buds,

had not produced a crop for several years.

Not merely the fruit set but also the size and maturity are affected by branch ringing. The apples, though relatively more numerous on ringed branches, were 11 to 23 per cent larger, Garber pears 9.3 per cent and peaches, cherries and grapes were also increased in size. The difference in all instances was great enough to be of commercial value. Increase in size of the fruit was closely correlated with increased color and ripeness. Maturity tests, as measured by means of the U. S. pressure tester, on apples, pears and peaches, showed that the fruit from ringed branches could have been harvested five to fourteen days earlier depending on the variety. Conspicuous differences in the same direction were noted also with cherries and grapes, though no definite maturity determinations were made.

Since ringing of branches and the necessary covering of the wound with wax is not as convenient an operation as may be wished, scoring was tried. Scoring consisted of cutting through the bark with a sharp knife two or three times completely around the limb, the cuts being a few inches apart. No bark was removed. It was found that scoring was equally as effective as ringing with the Delicious variety and beneficial also with Stayman, the two varieties used in this comparison.

The question may be raised: Under what circumstances might it be desirable and profitable to ring or score branches of fruit trees? Our experience seems to indicate that it may be advisable to use this treatment on a limited scale on vigorous trees of varieties that bear very small or subnormal crops. Scoring, because of convenience and lower cost, may be preferred to ringing. While most of the limbs on a tree may be treated, a few should be left to nourish the roots during the period when the wound has not yet completely healed. *It is not advisable to ring the whole tree around the trunk.* An exception is the grape, of which the whole plant may be ringed without danger. Ringing or scoring may also be tried, if for some reason it is desired to hasten the maturity of a particular variety. In general, however, it cannot be emphasized too forcefully that *weak trees should never be subjected to this treatment.* In our experience, over a period of three years no instance has occurred where a normally healthy tree has been injured by branch ringing.

Biennial Bearing and Spraying to Prevent Apple Fruit Set in the "On" Year

Some apple varieties may be regarded as pronounced biennial bearers (Yellow Transparent, Duchess, Wealthy, York), while others may drift into this habit as they become older. During the past few years biennial bearing has become an especially acute problem in the Central states because of frosts and recurring droughts.

We do not know at present of an economical orchard practice or a combination of practices that will change biennial into annual bearers. In light of our present information on the subject the following suggestions may be emphasized.

1. Select, if feasible, varieties that do not drift readily into alternate cropping.
2. Keep the trees, by whatever means are available, in a vigorous state—keep them young. This refers to the tree as a whole as well as to individual branches. Remove weak branches.
3. Do not permit trees to overbear. Thin the fruit heavily and regularly.
4. If once established, biennial bearing may be reduced and possibly broken by:
   a. Heavy flower bud or flower thinning, or
   b. Even heavier thinning of very young fruit—*before* the natural drops have been completed,
   c. Combined with nitrogen fertilization only in the fall of the "on" year and spring of the "off" year.

It should be pointed out in this connection that even such a drastic and costly program as flower bud or flower thinning, if it is at all feasible on a commercial scale, will not change biennial bearers into producers of crops annually. Killing spring frosts and excessive droughts may switch them back to the old habit, requiring a repetition of the treatment.

In the meanwhile growers may wish to experiment with so-called bloom-killing materials. These are sprays that will destroy all flowers in the "on" year, when the price for fruit is apt to be low, without serious injury to foliage and no apparent harm to the spurs and other parts of the tree. Trees so sprayed will flower and set fruit in the "off" year. These sprays, therefore, will not remedy biennial bearing to any extent but will merely switch the bearing to the normal "off" year, when a better return for the crop may be expected. Partial killing of blossoms by these caustic sprays has not been found successful so far, since the remaining

fruit may be russeted to various extents.

Spraying experiments for the prevention of fruit set have been conducted for the past seven years by Paul H. Shepard in co-operation with M. A. Smith of the U. S. D. A., at the Missouri State Fruit Experiment Station, Mountain Grove, Mo. They found that cresylic acid at one-half to two per cent and tar oil No. 1 at three per cent concentration were most effective for the destruction of apple flowers. The best time of application is during the late cluster bud stage, when the pedicels are readily killed by the spray. The job must be done thoroughly, otherwise a second spraying or hand picking of the non-killed blossoms or young fruit is required. When bought in relatively small amounts, the estimated cost of cresylic acid at one per cent concentration was about one and one-half cents per gallon and tar oil at two per cent concentration, approximately one cent per gallon of finished spray.

During the past year several of the most promising of these sprays were tried by the writer in co-operation with H. G. Swartwout at the Missouri Agricultural Experiment Station. The most effective ingredient in tar oil being undoubtedly the creosote part, we have used it alone and in three fractions ("cuts" of various boiling points). It was found that cresylic acid at one and one-half per cent concentration, though effective in killing blossoms on our trees, caused an uneven production of foliage and some spur injury. The lighter fractions of creosote oil (cuts 1 and 2) at one and one-half per cent concentration, on the other hand, destroyed the flowers efficiently without any permanent harm to the foliage or spurs. It is probable that the creosote oil will be put on the market in 1940 by the company that supplied it for this specific purpose.

For growers wishing to try this new bloom-destroying material, it is suggested that they spray small blocks of trees before adopting the practice for large acreages. By so doing, the producer will be able to determine the results for his conditions without taking undue risks.

Infectious Necrotic Enteritis of Swine and Its Effect Upon Hog Cholera Control

Condensed from Hog Breeder

Dr. George H. Conn
Freeport, Illinois

DURING the last few years there has been one swine disease that has spread very rapidly, particularly through the corn belt where hogs are often sold through community sales and at auction. This disease, while appearing in many forms in pigs of practically all ages, is generally known to the veterinary profession as infectious necrotic enteritis. Some of the other names by which certain types of complications of this disease are spoken of by some veterinarians are necrotic enteritis, bloody diarrhea, swine dysentery, pig typhoid and several other names.

This disease is caused principally by salmonella suipestifer which is usually complicated with another germ known as actinomyces necrophorus. It is the latter germ that causes the necrotic or rotting of the lining of the intestinal tract with which it comes in contact. In an earlier day these various diseases were frequently spoken of as swine plague.

The hog owner very often speaks of the chronic form of this disease as necro and it is because of this mistaken identity of the disease that many hogs are lost. The owner persists in treating his herd for necro without taking into account the other infection that is present, with the result that in many herds heavy losses are encountered before the conclusion is reached that there is some other disease present.

While most cases of infectious necrotic enteritis occur in pigs between the weights of 25 and 75 pounds, and this is probably due to the fact that parasites and other conditions reduce the vitality of the pig at this age and make it more susceptible, we do find that this condition often occurs in pigs that are only a few days old and it is sometimes found in pigs that are almost ready for market. Anything that will lower the natural resistance of swine will have a tendency to bring about this disease when this infection is present. The disease is most often found a short time after the pigs have been vaccinated against cholera or in two to three weeks after the pigs

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have passed through a community sale ring or auction sale where pigs have been kept.

It is reported by many veterinarians of extensive experience that most of the so-called vaccination breaks that occur a short time after the pigs have been vaccinated are nothing more nor less than the development of this infectious necrotic enteritis. Many of these same veterinarians claim only ordinary results in treating this disease when it follows so closely after vaccination. There are still other veterinarians that secure better results in vaccinating hogs where they suspect such a condition by giving them very large doses of serum and virus and in this way speeding up the immunity as much as possible so that there will be a very short time during which the pigs' resistance is at its lowest level.

It is generally recognized that there are two forms of this disease, i. e., the acute and the chronic form. It is the acute form that most veterinarians come in contact with as with this form of the disease there is usually more or less loss of pigs beginning shortly after the disease is first noticed, As a general thing when this disease appears in the herd only a few members of the herd are ill at one time. One or more hogs may be ailing and upon examination they will be found to have considerable temperature (if they are noticed early), they are gaunt in appearance, eat very little and the coat is rough. They have a stiff, stilted gait when walking and have an arched back. At this time there may be some thumping and a diarrhea usually develops. In most herds coming under our own supervision this diarrhea has been dark and tarrylike tinged with blood. If the pigs are not noticed for the first few days the temperature may be subnormal, but when taken shortly after the first sick animals are found most of the sick ones will show temperatures from 103 to 106 or in some instances even higher.

One symptom that is reported almost universally by veterinarians is that swine that are sick with this disease do not show a normal fill. They are always gaunt, thin sided, and have a tucked-up abdomen. Because there is considerable inflammation in the intestinal tract such animals lose weight rapidly for the reason that they do not have sufficient healthy absorptive surface in the intestines to take up the nutrition they require.

Upon making a post mortem examination the lesions most often found will be in the large intestines, and often lesions are found in the stomach as well. Very few lesions are found in the

small intestines. There may be some abnormal conditions of the kidneys and bladder. These look in some cases somewhat like hog cholera lesions. As a general thing this disease occurs in pigs that are less than six months old while cholera will occur in hogs of any age. This sometimes is of help in determining which disease is present. In some herds that have been properly vaccinated, and this disease appears shortly after, there is no question but what hog cholera in this case can be eliminated.

Some of the factors that predispose to this infectious necrotic enteritis are poor sanitation, poor housing, improper feeding, such as a lack of vitamins, minerals, proteins, etc., worms and sows that carry the infection in a chronic form. In some few cases this disease will take the form of a fatal pneumonia. Small inflamed areas will be found in the lungs of such animals.

There is another form of this disease which takes on the nature of diphtheria and these diphtheria-like patches will sometimes be found in the mouth and throat.

For the reason that this is a very complicated disease showing several different forms, it is not safe or advisable for the average swine owner to make any attempt to diagnose this condition himself. Without a doubt it is because of this disease that results in vaccinating hogs against cholera are in many cases so unsatisfactory. Many veterinarians now make it a routine practice where it can be done to inspect the herd carefully and examine several animals if they seem to be abnormal before vaccinating the herd and in many instances insist on a few days' treatment in order to get the herd in better condition before vaccinating them.

The first thing, of course, when one or more hogs are noticed to be ailing is to call in the best veterinarian that you can find and have this animal thoroughly examined, and in most instances it is most satisfactory to have the animal destroyed and a post mortem made. The owner, of course, can assist in bringing about a recovery and in the satisfactory treatment of this disease by thoroughly cleaning up and disinfecting all quarters, moving the animals if possible to clean ground and clean buildings and then keeping them as clean and comfortable as possible.

Since this disease in the acute form prevents the infected animal from eating very much feed, it is evident that the usual medicinal treatments often used for necro in swine are of very little value for the reason that the sick

animals can not eat sufficient of this treatment to get the usual results. In our practice we have been getting best results by using a swine mixed enteritis bacterin, vaccinating the entire herd at two or three day intervals until three doses have been administered. We feed the affected animals very lightly and in this connection one of the most valuable feeds that can be used is semi-solid buttermilk and a light, sloppy ration containing plenty of liquid and in which there is a very little if any corn.

Production Records Point the Way

Condensed from American Hereford Journal

Willard Taussig
Parshall, Colorado

FOR the past few years I have been pondering the question: Are the breeders of purebred cattle far enough in the lead in their job of beef improvement?

Since returning from the recent Denver stock show, where many carloads of choice feeder cattle were inspected, I am more impressed than ever with the fact that unless we purebred breeders show some action we may lose our advance position and with it our respect. There were steer calves in the stockyards at Denver, which, in the writer's opinion, might well have been left bulls and, if properly fitted, could have batted near the top in the individual classes at any of our national stock shows.

What can breeders of registered cattle do to forge ahead and blaze new trails in their great beef-production industry?

The first point I have in mind is that a complete production record should be maintained for each herd bull and each cow in the breeding herd.

One advantage we have over operators of commercial herds is the fact that every purebred cow is identified by her own individual number; also that it is essential for us to know just which bull each of the calves is sired by and that these calves are identified by their own number.

The continued improvement of beef cattle, which have already reached a high degree of perfection, is very difficult, due to the fact that it is impossible to measure accurately the production ability of any given individual. This throws all the responsibility for beef improvements on the judgment of each breeder.

A carefully planned and main-

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tained production record is the only means by which a breeder of registered cattle can in any way measure the ability of each animal in his herd to produce the best quality of beef in the most economical manner. I believe this record should be quite detailed and consequently there should be ample space on the record for all essential information. We use a heavy card, 9 by 10 inches in size. We feel that this record will be of great value long after the cow which it represents is dead.

The card is ruled with 10 equally distant horizontal lines, which will provide space to record essential facts concerning a dam and 10 calves. The top horizontal column is for the dam's record. Beginning at the left side of the card vertical lines are run one inch apart for six inches, with a wider column at the right side.

These cards are conveniently filed in a steel cabinet which is about 10 inches deep and equipped with handles so it can be easily moved from place to place. The cards are indexed in the cabinet so any card can be quickly found.

The next step is the difficult one; it takes much time and is very important. Go through the herd and grade each cow as to her individual merit, ignoring any knowledge you may have regarding her breeding or past production record. This takes a great deal of judgment due to the fact that all the cows will not be in equal condition due perhaps to no fault of their own. This must be taken into consideration in giving each cow a fair grade. We grade the top cows "A," those next to tops "B," and next "C." The grade is written in the top horizontal and second vertical column in the proper space.

In the first vertical column, at the top, we put the number or name of the dam of the cow graded and the name of her sire.

In the third column we record the color markings of the cow, whether light, medium or dark, and also any deviation from the Hereford color standard.

The fourth column is for a record of the head only—good, fair or poor.

The fifth column is for milk production which can usually be graded by the condition of the calf at weaning time.

The sixth column is headed "Fleshing Ability." This can best be graded in the cow about four or five months after her calf is weaned, but it is better to grade a heifer for fleshing before she drops her first calf.

The last column, the wide one at the right, is headed "Remarks," and in it should be recorded any visible defects in body conformation, together with any

Dam of 720 No. 437 by XX	Grade	Color and Markings	Head	Milk Production	Fleshing Ability	Remarks
720 Calved 1927 Sired by XXX	B	Dark	Fair	Good	Good	Good type; possibly a tendency to weakness in back; very low down
Heifer calf tattoo 947 1930 Sire No. 1	C C	Dark	Good		Fair	Low in back; legs a bit crooked; culled
Bull calf tattoo 24 1931 Sire No. 2	B B+	Dark	Good		Fair	Good type; perhaps a bit upstanding; sold to — for $— when fourteen months old
Bull calf tattoo 46 1932 Sire No. 3	A— A	Medium Dark	Good		Good	Good type; fitted for show, placed 10th in calf class at Denver; sold to — for $— when nine months old
Heifer calf tattoo 364 1933 Sire No. 3	B A—	Medium	Good	Fair	Good	Good type except a bit too much length in neck; kept for replacement
Bull calf tattoo 14 1934 Sire No. 3	A	Dark	Good			Calf died when three months old; cause unknown
Heifer calf tattoo 513 1935 Sire No. 3	A— B	Medium	Fair		Fair	Too much length and a bit low in back; culled
Heifer calf tattoo 612 1936 Sire No. 3	A A	Dark	Good	Fair	Good	Very low down and wide; legs a bit crooked; kept for replacement
1937		Failed to settle with calf				
Bull calf tattoo 56 1938 Sire No. 4, Son of No. 3	A A	Medium	Good		Good	Low down, deep, short body; showed 1st at county fair; sold to — for $— when six months old
1939		Cow No. 720 sold; failed to settle with calf				

physical weaknesses such as sterility, cancer, brisket disease, or any disease that might be inherited. All these grades and remarks pertaining to the cow should be in the column across the top of the card. The cow's horn number appears in the upper right hand corner of the card, as well as at the left, where her age is also recorded.

Now at the left end of the second horizontal column is placed the date, some three years later than the date of the birth of the cow, when her first calf will probably be dropped. In the same square is written the tattoo number of the first calf and the identity of its sire. The next horizontal column below is for the next year and the next calf, and so on down to the bottom of the card.

After all the cows are graded the breeder can start transferring the grade of each younger cow whose dam is in the herd to the proper column of her dam's card according to the year calved. There will no doubt be a number of blank columns in the older cows' cards due to offspring having been disposed of with no record left as to grade.

We grade all of our calves, first at from one to two weeks of age, recording the grade, color markings and head grade. The heifer calves are not graded until they are two years old unless they are sold before that time, in which case they are graded when sold. In the second grading all the columns on the dam's card are filled except the milk-production column. At this time the two-year-old heifers that are to be retained for replacement are given cards of their own.

The bull calves are graded the second time at from three to five months after weaning, the notation in each case going in the same column as the earlier grade given the calf when it was one to two weeks old. Also, at this time the calf should be rated as to fleshing ability and the remarks column filled out.

We are especially careful in our grading at this time as to fleshing qualifications. The calves have all been on the same feed rations for several months and the inherited ability of the calf to lay flesh must be carefully credited onto his dam's card and also to the calf's sire's record. We have found that the poorest time to grade calves is at weaning time due to the variable amounts of milk they have been getting from their dams.

In the remarks column also is recorded the price of each calf sold, when it was sold and to whom sold.

During the breeding season this record file is kept at the breeding corral and is always

consulted before the service in question is made. If a cow consistently produces grade A calves from a certain sire we naturally breed her back the same way. If the first calf from a heifer grades B or C, the next year we try her to a different bull. Also in breeding a heifer for the first time we can often save much time in finding the right nick by checking some of her full sisters and crossing her the same way as we have successfully crossed them.

This record is also very valuable—I think indispensable—in an inbreeding program. For example, a half-sister of one of our herd bulls is brought in which we would very much like to cross back to her half-brother. We consult the record and find that while the heifer graded very well and shows no conspicuous weakness, she has a number of sisters and brothers and possibly her dam, too, all of which are listed on their cards as having a certain weakness. We therefore fear that this particular fault, even though it doesn't show up in the heifer in question, is likely to be hidden in her blood stream and hence that it would be dangerous to concentrate by breeding her back to her half-brother. Also, cow families that show certain physical weaknesses, as mentioned above, under remarks, should be crossed out as much as possible with a record of this kind.

Materially Lessens Risk of Error

The whole picture can be seen at a glance, and while I wouldn't try to say that it makes the breeding of beef cattle a sure thing, I will confidently say that the risk of dangerous error is materially lessened.

The second of the two thoughts mentioned at the outset of this article concerns the necessity for greater co-operation between breeders of registered livestock. I feel that stronger confidence must be built up between purebred breeders than exists at the present time.

We will all agree that each breeder is better able to select the top calves in his own herd than anyone else, especially if he has been keeping some form of production record. If confidence can be built up we can help each other very much in the selection of breeding stock: first, by not recommending that a fellow breeder purchase an animal that may be attractive to him unless we feel sure from our better knowledge of its ancestors that it has every right to reproduce individuals like itself; second, by not allowing superior bulls to go to the range trade regardless of the price offered; and, this brings me up to the third point concerning breed improvement which is

—to properly develop young cattle and properly maintain mature ones.

Show a Few Tops Each Year

In every purebred herd of high quality a few top bull calves should be fitted every year and here again a breeder will find his production record of great value. We let all of our calves run with their dams until they are four or five months old, at which time we carefully select a few of the top calves to bring to the barn. These calves should always be selected from calves graded "A" at birth, regardless of how well some of the "B" or "C" calves have come along since then.

We should also keep in mind that the chances are good these calves eventually will find their way into purebred herds, so we must be extremely careful that we not only select calves that have ideal beef conformation but that their ancestors are also the best in the herd. After the calves are taken in to the barn we try to make sure that they get every opportunity to develop.

A breeder may say that he has a few calves that are of very high quality in beef-making characteristics but the only way he can prove that statement is to put the calves to the test. If they will lay on a smooth, thick covering of firm, mellow flesh, in a comparatively short length of time, it is reasonable to expect their offspring to do likewise under the same conditions.

In conclusion, I would like to give a thought regarding the possibility of helping ourselves and our industry by following the offspring of the sires we sell each step of the way from the purebred or commercial herd in which they are used, to the feedlots where their offspring is fattened, and from there to the market where the steers are sold and slaughtered.

Then we should learn to grade the carcass or at least to see how it is graded, and should compare the carcasses of the steers in which we are interested with those of champions. Then we might be able to go home and direct our efforts along a more constructive channel.

After all we are working for this one ultimate goal: to produce the greatest number of pounds of high quality meat in the shortest length of time per unit of feed consumed.

Feeding the Herd

Condensed from The Jersey Bulletin

J. B. Fitch and T. W. Gullickson
University of Minnesota

PROPER feeding of the dairy herd varies with seasons, and no definite rules will apply to all seasons and conditions. Certain fundamental facts and principles, however, if well understood and applied by the feeder, will prove helpful.

The dairy cow uses food for two main purposes, namely, for maintenance and for production. Production means not only milk production, but also growth and, in the pregnant animal, development of the unborn calf.

Like any intricate machine, a cow's body suffers constant wear and waste. It must constantly rebuild worn tissues, and this requires food. Food is needed also to keep the vital organs functioning properly, to maintain body temperature, and to provide energy for muscular activity. The nutrients used daily for these purposes are termed the maintenance requirement. In most herds approximately one half of the total ration is needed for maintenance.

Food is needed, likewise, for the various forms of production. Growth, milk production, or development of the unborn calf can take place only when the ration provides the necessary nutrient materials over and above those needed for maintenance. Like most machines, a dairy cow usually produces most economically when operating near her full capacity. That is why it pays to feed a dairy cow well.

To fulfill all the needs for which food is used in the body, the ration must furnish enough of each of at least six kinds of food substances, commonly known as nutrients. They are: (1) proteins, (2) carbohydrates, (3) fats, (4) water, (5) minerals, and (6) vitamins. Each of these nutrients performs one or more specific functions. They are present in different amounts in different feeds, but few feeds, if any, contain enough of all of them to supply the needs of the cow for both maintenance and production when fed in the usual amounts. The manner in which feeds are handled and prepared also affects their nutrient values.

Proteins.—The proteins are nutrients that contain nitrogen. Proteins make up about 17.5 per cent of the body of a mature dairy cow, being used in the for-

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mation of the skin, hair, horns, hoofs, blood, and muscular tissues, as well as in the curd of the milk. Proteins are absolutely necesary in the diet of all animals. No other nutrient or nutrients can take their place. The proteins found in different feeds vary in composition and in nutritive value, being made up of various combinations and amounts of about 25 different amino acids. Since at least five or six of these amino acids are needed by animals, it is important to supply a variety of feeds in the ration. A shortage of protein is the cause of low milk production in many dairy herds, because all farm-grown feeds except legumes are low in protein.

Carbohydrates.—The carbohydrates constitute the largest part of the nutrient material in most feeds. In the terms of the chemist, it is made up of crude fiber and nitrogen-free extract. It includes all the starches and sugars, together with the woody portion of feeds. Straw, corn fodder, and hays all contain large amounts of crude fiber. Grain and mill-stuffs contain less fiber, but are rich in starch and sugar.

The carbohydrates are used to maintain body temperature, and to provide energy for muscular activity, such as walking, eating, and respiration. In the animal body, all surplus carbohydrates are converted and stored as fat.

Fats.—As nutrients, fats are largely interchangeable with carbohydrates, but are two and a quarter times as rich in heat and energy. They also lubricate the digestive tract and aid the animal in keeping a glossy coat. About 20 per cent of the weight of a dairy cow comes from the fat in the body.

Because of their relatively greater abundance, feeds rich in carbohydrates and fats are usually cheaper than those high in protein. It is, therefore, unwise to use more proteins in a ration than necessary, though protein can serve the same purpose as carbohydrates or fats.

Water.—More than half the weight of a dairy cow is water. In younger animals, the percentage is still higher. The water in feed serves the same purpose as drinking water; that is, it carries the various nutrients to all parts of the body. Waste materials are dissolved in water and carried out through the urine, feces, and sweat. Water makes blood and lymph fluids so that they can circulate. By evaporation from the skin and through the lungs, water controls the temperature of the body. The importance of giving plenty of water to producing cows is indicated by the fact that milk is about 87 per cent water. All animals will live much longer

without solid food than without water.

Minerals. — Approximately 5 per cent of the weight of a dairy cow consists of minerals, most of which are in the skeleton. Milk also contains a high percentage of minerals, especially calcium and phosphorus.

The minerals perform a great variety of functions in the body. Besides building bones, they play an important part in all soft tissues of the body as well. Directly or indirectly, they influence the activity and work of each cell and organ. Further, they aid in the digestion and assimilation of food and supply the minerals in milk and in the developing unborn calf.

Cattle need about a dozen mineral elements, but normal rations usually provide enough for all these minerals except sodium and chloride. That need is met by allowing cattle free access to common salt.

Vitamins.—The vitamins, like other food substances, are essential to the life and well-being of all animals. Like the electric spark in a gas engine, they are small but important. Of the different vitamins so far discovered, only A and D appear likely ever to be deficient in dairy rations.

Vitamin A, the anti-infection vitamin, is essential even for the maintenance of mature cows and still more necessary during growth, pregnancy, and lactation.

Studies made at the Minnesota station indicate that a deficiency of vitamin A results in a breaking-down of the nervous system and lack of muscular control.

Cattle derive their vitamin A supply largely from feeds that contain the yellow coloring known as carotene. All green plants are especially rich in carotene, but haymaking may destroy much of it. With the possible exception of yellow corn, grains and concentrates are of little or no value as sources of vitamin A. Cod liver oil is one of the best sources of both vitamins A and D.

Vitamin D, the anti-rachitic vitamin, regulates the use of minerals in the body, especially of calcium and phosphorus. It helps control the growth and development of the bones and teeth. All cattle need vitamin D, but mainly during growth and reproduction.

Vitamin D deficiency in both young and old cattle causes such symptoms as stiffness, arched back, bent knees, swollen hocks, and lack of appetite for concentrates. Dairy cows may obtain their vitamin D from the ration and from exposure of their bodies to direct summer sunshine. Dairy cattle seldom lack vitamin D in summer or when fed good-quality sun-cured hay.

Control of Diseases and Insects

From the Book Vegetable Crops

Homer C. Thompson, Ph.D.

SEED treatment to control diseases and insects. Corrosive sublimate (bichloride of mercury) and formaldehyde have been used for many years for treating seed potatoes and, to some extent, for treating some vegetable seeds for certain diseases. These treatments are still used, but recently there has been a marked development in seed treatment with fungicidal dusts and solutions of fungicides. Hot-water treatment is used for the seeds of cabbage, cauliflower, Brussels sprouts, kale, turnip and other crucifers, for the control of black rot, blackleg and Alternaria leaf spot of these plants.

Hot-water treatment consists of putting the seed in cheesecloth bags and placing them in a vessel of water held at 122 degrees F. (50 degrees C.) for 25 minutes for cabbage and 15 minutes for other crucifers. The water should be stirred constantly and the temperature determined with a good thermometer. Then the bags are removed, dipped in cold water, and the seed spread out to dry. This treatment reduces the germination considerably, especially if the seed is old. It is desirable to test the seed for germination before treating and if germination is very low the treatment may ruin it.

Red copper oxide dust is used as a seed treatment for damping-off of crucifers, cucumber, muskmelon, squash, pumpkin, beet, eggplant, lettuce, pepper, salsify, spinach, peas and tomato. The seed is placed in a tight container and sufficient of the dust is added to coat thoroughly the seed with the dust. The container is shaken thoroughly and the surplus dust is screened out.

Corrosive sublimate is used for treating seed of cucumber, muskmelon, squash and pumpkin for scab and angular leaf spot, for celery seed to aid in control of early and late blight. One corrosive sublimate tablet to one pint of water or one ounce of powder to 7½ gallons of water is the usual recommendation and for seeds of the cucurbits mentioned soaking for 5 minutes is sufficient; for celery, soaking for 15 minutes is recommended. The

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seed is rinsed in water and allowed to dry before planting.

Calomel is used as a seed treatment for damping-off and for wire stem of crucifers and for the damping-off of celery. For celery seed one ounce of calomel is mixed thoroughly with one gallon of water. The seed is placed in tightly woven cloth sacks and dipped until the seeds are thoroughly wet. Then the seed should be thoroughly rinsed in running water, as considerable injury may result.

Copper sulphate solution may be used for treating seed of beets, eggplant, lettuce, pepper, salisfy and tomato, for damping-off, and for some of the seed-borne diseases of tomatoes. The seeds are put in cheesecloth sacks and soaked for one hour in a solution made by dissolving two ounces of copper sulphate in one gallon of water. The seed is dried before planting.

Semesan and Semesan Jr. are used as seed treatments to aid in the control of damping-off of crucifers, onions, peas and sweet corn. Follow the directions on the containers.

Bean and pea weevils can be kept under control by treating the dry seed with carbon disulphide. To be most effective the treatment must be made in the fall soon after harvest since the insects develop in the dry seeds.

Use of repellents. Plants are sometimes protected from insect injury by means of materials which repel the pests. Slaked lime, dry ashes, dust are often used to repel cucumber beetles. Bordeaux mixture is used for protecting plants against flea beetles, the foliage being thoroughly coated with the material.

Hand picking insects. This is a practicable method for the control of tomato worms, squash bugs, and blister beetles in home gardens or on small areas.

Growing resistant varieties. In the control of some plant diseases the growing of resistant varieties is the most practicable means of control. In some cases, this is the only feasible means of controlling certain diseases such as the asparagus rust, Fusarium wilt of tomatoes, anthracnose of beans, cabbage yellow, and spinach blight (yellow and mosaic). Great progress has been made during recent years in developing strains and varieties of various crops resistant to specific serious diseases.

Killing insects and preventing disease injury by spraying and dusting. Insects are classified into two classes: (1) chewing or biting forms which devour the leaves and other parts of the plants, and (2) sucking insects which injure and destroy plants by sucking their juices. For the

former stomach poisons generally are employed as insecticides, arsenicals being the most common. However, some of the chewing insects are killed by contact with insecticides and by fumigants. Sucking insects cannot be killed by stomach poisons as they do not eat the surface that contains the poison. For such pests some insecticide that kills by contact or by the fumes being inhaled must be used. Kerosene emulsion and various dusts and sprays containing nicotine are the most popular insecticide for these.

Many fungous diseases are controlled by spraying or dusting the plants with material poisonous to the fungus, but harmless to the plant. Some bacterial and some virus diseases are controlled by destroying or repelling insects which harbor or carry infection. Plant lice and other insects carry the virus of mosaic diseases and the cucumber beetle is known to be the carrier of bacteria causing bacterial wilt of cucumbers and of other curcurbits. In the case of bacterial wilt of cucumber, the bacteria are dependent on the cucumber beetle for aid in the life cycle.

In spraying or dusting for disease control, the material should be applied before the disease appears, or at least before it has gained much of a foothold, for most treatments prevent the development and spread rather than destroy it after it is established. Spraying or dusting before a rain is preferable to applying the material after a rain since the spores germinate best under moist conditions. If the fungicide is applied after a rain it may be too late to control the disease. Spray materials should be applied far enough in advance to allow it to dry before rains.

Timeliness and thoroughness. In all insect and disease control measures, timeliness and thoroughness are important considerations. For instance the fungicide should be applied before the appearance of the diseases or at least as soon as there is the slightest evidence. It is too late to control diseases after they have seriously injured the crops. Even for insect control, treatment is most effective when the material is applied as soon as the insects make their appearance. If the treatment is delayed too long the plants may be seriously injured or killed before the insects are destroyed.

Since insects are killed mainly by eating the poison, or by coming into contact with the insecticide and since disease spores are killed by contact with the fungicide, it is important to cover all parts of the plants with the spray or dust. For the control of many diseases and insects the underside

of leaves, as well as the upper side, should be covered. Spray materials should be applied as a fine mist so as to cover the surface without having the liquid collect in drops and run off. High pressure is necessary to get a fine mist. In order to get good distribution insecticides in the form of dusts should be finely divided.

Insecticides. There are four general types of insecticides: stomach poisons, such as the arsenicals; contact poisons, such as kerosene emulsion and the various oil sprays; fumigants such as carbon disulphide, hydrocyanic acid gas, nicotine fumes; and repellents which do not kill the pests but merely repel them. Among the stomach poisons the arsenicals, such as arsenate of lead, arsenate of calcium, and arsenate of magnesium are the most common. Arsenicals should not be used on vegetables when there is danger of residues remaining on the edible portions of the plants at harvest. They may be used on cabbage, cauliflower, and similar plants during the early stage of growth but when the heads begin to form other materials that do not leave poisonous residues should be used. One of the newer insecticides is rotenone, the chief source of which is derris and cube root. Preparations containing rotenone may be used on vegetables without danger to man and, for this reason, rotenone dusts and sprays have become very popular in recent years. Hellebore, an insecticide made from the root of the hellebore plant, and pyrethrum, prepared from the flower of the plant of the same name, are also used to some extent where it is unsafe to use arsenicals.

Arsenicals. Arsenate of lead is the most effective of the arsenicals and may be used on most vegetable crops, but it is more likely to injure the foliage than is either calcium arsenate or magnesium arsenate, These materials may be used either as a dust or as a liquid spray. As a spray, the arsenicals may be used with Bordeaux mixture or with nicotene sulphate solutions without impairing the effectiveness of either. As a dust, the powdered form of the arsenical is mixed with hydrated lime or other finely divided dry material in varying proportions depending on the kinds of plant to be dusted. To be most effective the dust should be applied when the foliage is moist and the air movement slight.

Rotenone-Bearing insecticides. The chief source of rotenone is derris and cube root. The strength of rotenone preparations is indicated by the proportion of

rotenone they contain, although this is only an approximation because some of the other ingredients have insecticidal value. The percentage of the total active ingredients is usually indicated. Insecticides containing rotenone are available as extracts and dusts. Extracts from derris, cube, or other materials that contain known percentages of rotenone are sold under various names. They may contain pyrethrins in varying quantities, equal to or slightly in excess of the rotenone content.

Pyrethrum. Insecticides made from pyrethrum are sold in two forms: extracts and dusts. Most of the extracts are rather expensive. Pyrethrum dusts are of two kinds, the ground flowers diluted with talc or other carriers and those made by combining pyrethrum extracts with certain carriers. Experimental results indicate that the impregnated dusts are superior to that of the ground-flower dust in the control of such insects as the cabbage looper and zebra caterpillar.

Tobacco preparations. Nicotene, the poisonous principle of tobacco, is an alkaloid that seems to kill insects through the action of the vapors on the nervous system. Tobacco dust and various decoctions have been used for a long time for the control of plant lice and other sucking insects. The ground stems and leaves often are used as a dust against plant lice. Tobacco stems are used to some extent for fumigating greenhouses.

Commercial extracts of tobacco are now available in commercial quantities and these generally are preferable to the tobacco as they contain known quantities of nicotine. There are two classes of nicotine extracts, one known as free nicotine and the other as nicotine sulphate. Various materials used in the manufacture of insecticide dusts have different effects on the volatilization, others are inert and have no effect on the nicotine other than to expose a large surface for its evaporation, while still others are active in that they change nicotine sulphate into more volatile forms.

When the nicotine sulphate is used alone it is recommended that soap, at the rate of 4 to 5 pounds to each 100 gallons of water be added to increase its spreading power, and to aid in liberating the nicotine. When used as dusts 2 or 3 per cent nicotine is satisfactory. Usually 20 to 40 pounds of the dust are applied per acre, the quantity depending on the size of the plants or the foliage surface to be covered.

Fungicides. The term fungicide is applied to any material used to control fungous diseases. Bor-

deaux mixture is the most common one. Others, such as sulphur, corrosive sublimate and formalin are used to some extent.

Bordeaux mixture. A common formula is 4-4-50, meaning 4 pounds of copper sulphate, 4 pounds of lime and 50 gallons of water. Some crops, such as cucumbers and muskmelons, seem to be injured by lime and some authorities recommend a 4-2-50 formula for use on these two crops.

Copper-lime dust. Copper-lime dust is used to a considerable extent in some sections. There is considerable difference of opinion among authorities on the relative effectiveness of liquid Bordeaux and dry Bordeaux for the control of various diseases. Results of some experiments have shown practically as good control with the dry as with the liquid, while others have shown the liquid spray to be more efficient. In the home garden, the use of dust is more practicable than is spraying. For many diseases it is probable that dusting is as effective as spraying where other than power sprayers are used.

Corrosive sublimate (mercuric chloride). Corrosive sublimate, 1 part to 800 or 1000 parts of water is an effective disinfectant for potato and sweet potato seed as well as for seeds of other crops. It is also effective in the control of cabbage maggot. Weaker solutions are used in treating some seeds which are injured by the 1 to 1000 strength solution. Corrosive sublimate is a deadly poison and should be used with the greatest of care. It corrodes metal, therefore, only wooden or earthenware receptacles should be used to keep it in.

"The above is an excerpt from VEGETABLE CROPS by Homer C. Thompson, Ph.D., Professor of Vegetable Crops, Cornell University. This book is highly recommended for the back yard gardener or the grower. It is published by McGraw-Hill Book Co. ($5.00) and for the convenience of our readers it may be purchased through the FARMERS DIGEST."

Developing New Breed of Chickens

Condensed from Farm and Ranch

Bill Perdue

A NEW breed of chickens whose sex can be easily told when they are first hatched has been developed at Oklahoma A. and M. College by Dr. R. George Jaap, poultry specialist. Through distinctive color differences at hatching, the males and females can be easily segregated, even by a layman.

Although "autosexing" is not entirely new in the field of poultry genetics, Jaap's work probably is the most practical done because he has developed a breed which promises to have a high egg production and a good meat body shape.

White Plymouth Rocks, Rhode Island Reds and Dark Cornish fowls were used as foundation stock for the new strain which is known as "Oklabar" as a result of the characteristic barred markings. Oklabar male chicks are light colored and the females are dark.

Development of the new breed was begun four years ago, the first aim being to introduce the color differentiation into the breed. This having been accomplished, Jaap is now engaged in perfecting egg production, early feathering, and body shape in the birds. He estimates it will require three or four more years to do this properly.

However, many of the fowls have proved to be good egg producers, and body shape has been good in many of the new Oklabars.

Autosexing describes those varieties which have a particular color inheritance which allows easy separation of male and female chicks at hatching. In all cases the down color of the male is distinctly lighter in color than that of the female. "Since no previous training is necessary to identify the sexes, it appears probable that autosexing varieties will become very common in the near future," Jaap says.

"Should the automatic sexing principle be retained in such genetic combinations which give 100 per cent accuracy, this method will be much superior to the so-called Japanese or cloacal method. This latter method is never completely accurate, even at its best," he added. (Oklabars have proved to be 100 per cent

Reprinted by permission from Farm and Ranch, March, 1940, Dallas, Texas

accurate in their color markings). "Automatic sexing also would eliminate the added expense entailed in present sexing methods."

Description of the method for producing autosexing breeds is given by Jaap.

Any autosexing variety must have the inherited characteristic which places white cross bars on the feathers. This is obtained from the Barred Plymouth Rock variety. Because Barred Rocks are fundamentally black birds with the heredity for white bars super-imposed, accuracy in distinguishing sex in this variety is usually poor.

Since the differences between the sexes are not distinct, it is doubtful whether sex may accurately be distinguished in the Barred Rocks.

"The key to autosexing is to partially eliminate this black color from the chick down," Jaap explains. "It appears probable that the most satisfactory baby chick color is a striped down. This may be a striped brown, e. g., Light Brown Leghorn, or striped silver, e. g., Silver-Penciled Plymouth Rock."

Basic down color of an autosexing variety must retain sufficient color to allow the expression of barring to be at its maximum strength. In true breeding barred birds, the male chick is much lighter colored than the female. Using the striped down colors, the basic inheritance is such that this effect of inherited barring makes a distinct difference between male and female chicks.

More time and more matings are required in developing autosexing in desirable and large-bodied American breeds than in the case of the smaller breeds. In the first place, there is no desirable down color in the common varieties, the most suitable approximation being found in the deeply-pigmented Rhode Island Red chicks. Since these may occasionally be almost white when hatched, their down color is not suitable for perfect sexing.

As a result of these difficulties, the Oklahoma Agricultural Experiment Station has taken on the problem as a service which may have definite future value.

In developing the Oklabar, the first cross used was that of White Plymouth Rocks and Rhode Island Reds. The White Plymouth Rocks were used because latent in the coloring were striped down color and barring inheritance. These had previously been revealed by cross breeding.

Since striped down color and white bars on the feathers were secured in the first generation, a male of this type was mated to Rhode Island Red females. The white down color which is hidden

as a recessive character in colored birds was then removed by test matings with the White Plymouth Rock.

The birds which proved to be free from the hidden white down color were then mated together. In their progeny, the light-colored, blotchy type of male chick appeared. The autosexing variety was produced by mating these males with females which were striped as chicks and had cross bars of white on their feathers.

All striped male chicks produced in this manner were distinguishable at a glance. Both sexes could have been tested at this point for purity of striped down. But there are two other desirable characteristics which should be a part of any suitable heavy breed, and to economize in time, it was desirable to introduce all desirable characteristics before the variety was tested for purity.

Utility chickens should have (1) good table quality and (2) absence of "bare backs" in broilers. Both of these characteristics are found in a particular strain of Dark Cornish which was being reared at the Station. So the table quality and early feathering are being introduced into the new breed from this strain of Dark Cornish.

Introduction of this strain will destroy the automatic sexing principle for a few generations, but unless those desirable qualities are in the Oklabars they will have little practical value.

Automatic sexing has been known for about nine years. The phenomenon was first described and published by two Cambridge University professors in England. In the United States at present, autosexing is being studied at Cornell University in addition to the studies at Oklahoma A. and M. College.

Are They Vermin?

E. Lawrence Palmer

Prof. of Rural Education, Cornell University

SHARP-SHINNED HAWK

Accipiter velox velox

(Wilson)

Description—Length, to 14 inches; wing spread, to 27 inches; weight, to 8½ ounces. Female, usually larger than male. Longer and slimmer than sparrow hawk or pigeon hawk; shorter-winged and smaller than the Cooper's hawk. Tail, long, slender, "square-tipped"; not rounded as in Cooper's hawk.

Where found—Woods or groves or sometimes in the open, flying with quick wing-beats alternately sailing and soaring.

Range—Breeds from northwestern Alaska to Newfoundland and south to northern Florida and southern British Columbia. Winters southeastern Alaska to New Brunswick, south to Panama.

Relations and life history—Two American species, the other, the Cooper's hawk. Nest, usually high in a tree; of loose sticks, the size of a crow's nest; about 6 inches deep and sometimes lined with bark. Eggs, 3 to 6, bluish white to cream, spotted with chocolate color, 1.55 by 1.2 inches. Incubated, 21 days. Young downy, blind, and helpless at first, assuming adult plumage in about 2 years. One brood a year.

Behavior—Food, largely birds and insects. Of over 1000 stomachs examined, 844 contained other birds; 16, poultry or game birds; 45, insects; and 28, mammals. It has been known to kill large numbers of grasshoppers and moths. Surprisingly brave in its attacks on other birds, some larger than itself. Call a repeated "quee."

Reaction to heat, light, and moisture—Active in the daytime. A permanent resident. Mates about April. May molt April to October. Winter feathers fade before spring. In fall, may move in great flocks following food species.

Relation to man's interests—Injurious to poultry and other useful birds, and therefore may be considered vermin. Not protected by law in any State.

For the Farmer's Library

These books are recommended as outstanding in their field:

Beef Cattle—By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Son, Inc. $4.00.

(See Farmers Digest, November, 1939)

Breeding Your Own, or Raising Colts for Pleasure and Profit — By Clarence E. Bosworth. The Derrydale Press ($10.00). A book suitable for the breeders of hunters' and saddle horses.

Dairy Cattle and Milk Production—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. Macmillan Company. $3.60.

(See Farmers Digest, February, 1940)

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, head of the Animal Dept., Cornell Univ. Morrison Press. $5.00.

(See Farmers Digest, October, 1939)

Farm Meats—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. Macmillan Co. $2.90.

(See Farmers Digest, January, 1940)

Poultry Husbandry—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw, Hill & Co. $4.00.

(See Farmers Digest, July, 1939)

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. Macmillan Co. $3.75.

(See Farmers Digest, September, 1939)

Vegetable Crops—By Homer C. Thompson, Ph.D., Prof. Veg. Crops, Cornell Univ. Pub. McGraw Hill Book Co.

(See Farmers Digest, May, 1940)

For the convenience of our readers, books listed may be purchased through this Department. Address C. Leavitt Dyer, Farmers Digest, Ambler, Pa.

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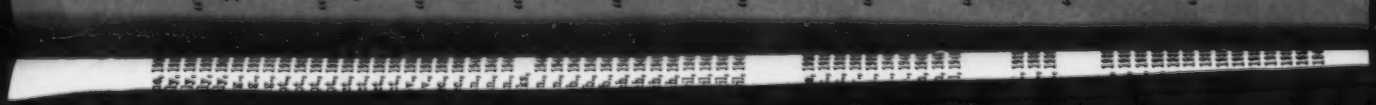

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